

Report to Congress:Wastes from the Combustion of Fossil  
Fuels  
(EPA Docket #F-2000-FF2F-FFFFF)

Public Comment Summary and Response Document

U.S. Environmental Protection Agency  
Office of Solid Waste  
Washington, D.C.

April 25, 2000

## **INTRODUCTION**

This document presents a summary of and response to comments submitted by interested parties on EPA's Report to Congress (RTC) on Wastes from the Combustion of Fossil Fuels, published in March 1999. The RTC was prepared pursuant to Sections 3001(b)(3)(A)(i) and 8002(n) of the Resource Conservation and Recovery Act (RCRA), which require that EPA study certain large-volume wastes generated primarily from the combustion of coal or other fossil fuels. These fossil fuel combustion (FFC) wastes are "special wastes" excluded from regulation under Subtitle C of RCRA, pending the results of this study. The March 1999 RTC represents Part 2 of EPA's study of FFC wastes and addresses the following waste types:

- Coal combustion wastes (CCWs) that are comanaged with low-volume wastes, wastes from the combustion of petroleum coke, and wastes from mixtures of coal and other fuels ("coburning") generated by electric utilities.
- CCWs, petroleum coke combustion wastes, and wastes from coburning generated by non-utilities.
- Coal combustion wastes, petroleum coke combustion wastes, and wastes from coburning generated by facilities that employ fluidized bed combustion (FBC) technology.
- Oil combustion wastes (OCWs) generated by utilities and non-utilities.
- Natural gas combustion wastes generated by utilities and non-utilities.

Utility CCWs that are managed alone (Part 1 wastes) were the subject of a previous Report to Congress in 1988 and a Regulatory Determination in 1993 that concluded to retain the exemption for these wastes.

The comment period initially lasted from April 28, 1999 through June 14, 1999.<sup>1</sup> EPA received 65 comment letters during and immediately following this period. EPA also held a public hearing on May 21, 1999. Nineteen commenters, many of whom also submitted comment letters, presented testimony at this hearing. Following the initial comment period, the comment period was reopened until September 24, 1999 as the result of a court order dated September 2, 1999.<sup>2</sup> EPA received more than 100 additional comment letters during the reopened period, many of them from the same commenters who responded during the initial comment period. Table 1 specifically lists the commenters, along with the codes that are used to identify the commenters in this document.

The commenters included public interest groups and private citizens, most of whom requested an extension to the comment period. Public interest group commenters generally disagreed with the tentative conclusions of the RTC. The commenters also included utilities; non-utility fossil fuel combustors; coal, oil, and gas interests; ash marketers and users; and trade associations representing these groups. They also included academics, state regulatory agencies, federal agencies, state legislators, and a U.S. congressman. These commenters generally supported the tentative conclusions of the RTC.

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<sup>1</sup> 64 FR 22820. April 28, 1999.

<sup>2</sup> 64 FR 50788. September 20, 1999.

In preparing this document, EPA carefully reviewed and summarized all of the individual comments. Next, comments were assigned a major topic category and sub-category. Table 2 lists the topic categories used in this analysis. The appendix to this document is the result of this effort. Specifically, the appendix summarizes comments, *by commenter*, with references back to the topic categories used here.

The Agency then disaggregated the information contained in individual comment letters and organized the verbatim comments according to category. In cases where several commenters raised a similar issue, EPA consolidated the comments into a generic summary, taking care to ensure that every argument and topic was fairly represented. The goal was to capture all of the major ideas and issues identified by commenters in a concise manner for efficiency of response. With this in mind, comments are summarized in the body of this document *by topic*, followed by responses to each issue under the topic area. The summary and response is followed by a list of the *verbatim comments from the commenters* related to that topic. Each verbatim comment is referenced with the commenter code so that the individual commenters with issues in that topic area may be identified.

Table 1: List of Commenters by Commenter Code	
Commenter Code	Commenter
49CAO00058	49 Citizen Action Organizations
ACAA00022	American Coal Ash Association (initial comments)
ACAA00276	American Coal Ash Association (supplemental comments)
ACV00307	ACV Power Corporation
AEP00060	American Electric Power
AES00250	Allegheny Energy Supply
AFPA00016, AFPA00061	American Forest & Paper Association (request for extension only)
AIRP00270	Air Products, Inc.
ALA00012	American Lung Association, et al. (request for extension only)
ALA00036	American Lung Association, et al. (initial comments)
ALA00292	American Lung Association, et al. (supplemental comments)
ALAXXXX	American Lung Association, et al. (additional supplemental comments)
AMI00372	Amerikohl Mining, Inc.
APSC00043	Arizona Public Service Company
ARIPPA00019	Anthracite Region Independent Power Producers Association (initial comments)
ARIPPA00273	Anthracite Region Independent Power Producers Association (supplemental comments)

<b>Table 1: List of Commenters by Commenter Code</b>	
<b>Commenter Code</b>	<b>Commenter</b>
BCHRL0002	Congressman Boucher
BUCK00333	Buckeye Forest Council
BG00063	Bio Gro
BMT00032	Boral Material Technologies Inc.
CAAM00009	Clean Air Alliance of Michigan (request for extension only)
CAC00014	Clean Air Council (request for extension only)
CATF00001	Clean Air Task Force (request for extension only)
CCC00310	Citizens Coal Council
CIBO00052	Council of Industrial Boiler Owners (initial comments)
CIBO00280	Council of Industrial Boiler Owners (supplemental comments)
CIN00254	Cinergy Corporation
CITZ00256	Robert O. Tintsman
CITZ00257	Bobby Atkinson (initial comments)
CITZ00260	Janet Thorndike
CITZ00261	Samuel Cook
CITZ00262	David Charbon
CITZ00263	Eve Early
CITZ00264	Paul Goettlich
CITZ00265	Dixie Wagner
CITZ00267	Nicholas Noe
CITZ00268	Tom Rodd
CITZ00271, CITZ00347	Richard A. Stout
CITZ00284	Enid Sisskin
CITZ00286	Rebecca Roth
CITZ00287, CITZ00288	Steve Oaks
CITZ00289	Teri Blanton
CITZ00290	Elizabeth Cauvel
CITZ00291	Elizabeth Fine
CITZ00303	Arthur Edelstein

<b>Table 1: List of Commenters by Commenter Code</b>	
<b>Commenter Code</b>	<b>Commenter</b>
CITZ00304	Gregory Buck
CITZ00311	Stephen Jr. and Patricia Hall
CITZ00312	Mary Ealine Lefler
CITZ00313	Kenneth Mann
CITZ00314	Jeff Jarrett
CITZ00315	John M. Morgan
CITZ00316	Jack Jarrett
CITZ00317	Gary Alvah Eck, P.E.
CITZ00318	Paul Lefler
CITZ00319	Kenneth W. Page
CITZ00320	Daniel Lefler
CITZ00321	Ricki Smith Newman
CITZ00322	Karl Halwes
CITZ00323	Rader Hoffman
CITZ00324	Alpha Beckett
CITZ00325	Richard P. Lefler
CITZ00326	Al Tinsley
CITZ00327	Dana Nixon
CITZ00328	William A. Miller
CITZ00329	Ronald F. Clark
CITZ00330	Marietta Smith
CITZ00331	Thomas Mosley
CITZ00335	Kathy Van Dame
CITZ00336	Randy and Mary Netzley
CITZ00337	Dianne Burnham
CITZ00338	David Scott Coker
CITZ00339	Valerie J. West
CITZ00340	Judy Page
CITZ00341	John Ciresi
CITZ00342	David Helm

<b>Table 1: List of Commenters by Commenter Code</b>	
<b>Commenter Code</b>	<b>Commenter</b>
CITZ00343	Benjamin E. Saller
CITZ00344	Lauren M. Carling
CITZ00345	Bobby L. Atkinson (additional comments)
CITZ00346	Doyle Coakley
CITZ00348	Larry E. Wira, Sr.
CITZ00349	Thomas and Sandra Tokarski
CITZ00350	Unknown
CITZ00351	Susan Vonderheide
CITZ00352	Nancy Gehlhausen
CITZ00353	Anita Besing
CITZ00354	David E. and Dorothy French
CITZ00355	Mare W. Waller
CITZ00356	Ruth Page
CITZ00357	Elaine Waller
CITZ00358	Sarah Elizabeth Frey
CITZ00360	John F. Gurnitz
CITZ00361	Jody Gurnitz
CITZ00362	Ethel Zink
CITZ00363	Linda Dively
CITZ00364	Travis Pinkston
CITZ00365	Julia Gurnitz
CITZ00366	Scott Pinkston
CITZ00367	Perry Dively
CITZL0008	Larry D. Brown
CITZL0011	Alice Bostwick
CITZL0013	Vivian Stockman
CITZL0015	David Cole
DCCC00359	Bernard Reilly, Dickenson County Citizens Committee
DOE00020	U.S. Department of Energy
DTC00038	Dravo Technology Center

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<b>Commenter Code</b>	<b>Commenter</b>
EDF00021	Law Office of David J. Lennett (representing the Environmental Defense Fund)
EERC00044	Energy and Environmental Research Center
EMEAC00010	Eastern Michigan Environmental Action Council (request for extension only)
EPC00255	Ebensburg Power Company
EPCAMR00248	Eastern Pennsylvania Coalition for Abandoned Mineland Reclamation
FW00277	Foster Wheeler Mt. Carmel, Inc.
G&KL0016	Gallagher & Kennedy
G&L00252	Law Offices of Greco & Lander, P.C.
GHIL0012	Geo-Hydro, Inc.
GPC00297, GPC00370	Gilberton Power Company
HEC00055	Hoosier Environmental Council (initial comments)
HEC00056	Hoosier Environmental Council (additional comments)
HEC00281, HEC00332	Hoosier Environmental Council (supplemental comments)
HECL0009	Hoosier Environmental Council (additional supplemental comments)
HECL0014	Hoosier Environmental Council (additional supplemental comments)
ICC00269	Indiana Coal Council, Inc.
IDNR00062	Indiana Department of Natural Resources
IEU00018	Indiana Electric Utilities
ILDNR00026	Illinois Department of Natural Resources
IMCC00027	Interstate Mining Compact Commission
ISG00048	ISG Resources
IWLA00006	Izaak Walton League of America (request for extension only)
KCC00298	Kerry Coal Company
KYC00285	Kentuckians for the Commonwealth
LEAF00005	Legal Environmental Assistance Foundation (request for extension only)
LRCAXXXX	Lackawanna River Corridor Association
MCC00051	Mettiki Coal Corporation

<b>Table 1: List of Commenters by Commenter Code</b>	
<b>Commenter Code</b>	<b>Commenter</b>
MDCAL0001	Maryland Coal Association
MDE00047	Maryland Department of the Environment
NCCLP00282, NCCLP00371	National Citizens Coal Law Project
NCE00031	New Century Energies
NCSEA00334	Richard Karkrader, North Carolina Solar Energy Association
NMA00013	National Mining Association (request for extension only)
NMA00024	National Mining Association (initial comments)
NMA00272	National Mining Association (supplemental comments)
NPCA00259	Don Barger, National Parks and Conservation Association
NRCM00004	Natural Resources Council of Maine (request for extension only)
NSP00057	Northern States Power Company
NVIC00039	N-Viro International Corporation
OA00011	Ozone Acton (request for extension only)
ODOD00017	Ohio Department of Development (initial comments)
ODOD00054	Ohio Department of Development (additional comments)
OHDNR00028	Ohio Department of Natural Resources
ORBCL0002	Ohio River Basin Commission
OSM00283	U.S. Department of the Interior, Office of Surface Mining
OSU00015	Tartinjit Butalia, Ohio State University
OSU00046	Warren A. Dick, Ohio State University
OVEC00003	Ohio Valley Environmental Coalition (request for extension only)
PA00045	Mary Jo White, Pennsylvania Senate
PA00247	Raphael Musto, Pennsylvania Senate
PA00253	Samuel H. Smith, Pennsylvania House of Representatives
PA00293	Pennsylvania Joint Legislative Air & Water Pollution Control & Conservation Commission
PA00296	Carole Rubley, Pennsylvania House of Representatives
PA00300	John N. Wozniak, Pennsylvania Senate
PA00301	J. Barry Stout, Pennsylvania Senate
PA00302	Edward W. Helfrick, Pennsylvania Senate



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PA00305	Jennifer L. Mann, Pennsylvania House of Representatives
PA00368	Julie Harhart, Pennsylvania House of Representatives
PAL0004	Charles W. Dent, Pennsylvania Senate
PAC00029	Pennsylvania Anthracite Council
PADEP00025	Pennsylvania Department of Environmental Protection (initial comments)
PADEP00246	Pennsylvania Department of Environmental Protection (supplemental comments)
PAEC00251	Pennsylvania Environmental Council
PAL0001	Pennsylvania State Senate Environmental Resources and Energy Committee
PMRABL0003	Pennsylvania Mining and Reclamation Advisory Board
PCA00034	Pennsylvania Coal Association
PCCL0007	Pennsylvania Coal Caucus
PCLP00249	Piney Creek LP
PEACE00306	Protect Environment and Children Everywhere
PG&E00023	PG&E Generating (initial comments)
PG&E00274	PG&E Generating (supplemental comments)
PHS001	Natural Resources Defense Council (public hearing statement)
PHS002	Clean Air Network (public hearing statement)
PHS003	Clean Air Task Force (public hearing statement)
PHS004	Council of Industrial Boiler Owners (public hearing statement)
PHS005	Utility Solid Waste Activities Group (public hearing statement)
PHS006	Detroit Edison and Utility Solid Waste Activities Group (public hearing statement)
PHS007	American Coal Ash Association (public hearing statement)
PHS008	Florida Power and Light (public hearing statement)
PHS009	Northern States Power Company (public hearing statement)
PHS010	Hoosier Environmental Council (public hearing statement)
PHS011	U.S. Department of Agriculture (public hearing statement)
PHS012	Barry E. Sheetz, Penn State University, representing the Anthracite Region Independent Power Producers Association (public hearing statement)

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<b>Commenter Code</b>	<b>Commenter</b>
	statement)
PHS013	Pennsylvania Power and Light and the American Coal Ash Association (public hearing statement)
PHS014	National Mining Association and Anchor Energy (public hearing statement)
PHS015	W.L. Daniels, Virginia Tech (public hearing statement)
PHS016	Bradley Paul, University of Southern Illinois (public hearing statement)
PHS017	Indiana Electric Association (public hearing statement)
PHS018	W. Miller, University of Georgia (public hearing statement)
PHS019	U.S. Generating Company (public hearing statement)
POW00369	Protect Our Woods
PSU00040	Richard Stehouwer, Penn State University
PURD00294	Kenneth J. Eck, Purdue University
RICE00041	H.C. Clark, Rice University
SAVV00266	Save the Valley, Inc.
SIERRA00278	B. Hayden, Hoosier Chapter, Sierra Club
SMC00299	Shamrock Minerals Corporation
SOCM00279	Save Our Cumberland Mountains, Inc.
SCRBL0006	Susquehanna River Basin Commission
SRELXXXX	William A. Hopkins, Savannah River Ecology Laboratory
STR00050	Stream Restoration Incorporated
TBCC00035	Thunder Basin Coal Company
TEGI00308	Tractebel Electric & Gas International
TFEEE00007	Texas Fund for Energy & Environmental Education (request for extension only)
TRI00295	Tri-State Citizens Mining Network
TVA00049	Tennessee Valley Authority
TXU00053	TXU Business Services
USWAG00037	Utility Solid Waste Activities Group (initial comments)
USWAG00275	Utility Solid Waste Activities Group (supplemental comments)
VAP00042	Virginia Power

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VAT00033	W.L. Daniels, Virginia Tech
VAT00309	Donald S. Cherry, Virginia Tech (initial comments)
VATL0010	Donald S. Cherry, Virginia Tech (additional comments)
VW00258	Valley Watch, Inc.
WSERC00002	Western Slope Environmental Resource Council (request for extension only)
WVA00059	West Virginia Oil and Natural Gas Association and the Independent Oil and Natural Gas Association of West Virginia
WVCAG00008	West Virginia Citizen Action Group (request for extension only)
WVDEPL0003	West Virginia Division of Environmental Protection

<b>Table 2: Topic Categories</b>	
I	Coal Combustion Wastes (including comanaged utility waste, non-utility waste, and FBC waste)
II	Oil Combustion Wastes
III	Natural Gas Combustion Wastes
IV	Pyrites Comanaged with Coal Combustion Wastes
V	Waste from Coburning
VI	Beneficial Use
VII	Minefill
VIII	Agricultural Use
IX	Duration of Comment Period
X	Scope of the Exemption
XI	Completeness of Report and Record
XII	Transparency of Report and Record
XIII	Waste Characterization
XIV	Risk Methodology in General
XV	Ground-water Risk Modeling
XVI	Non-groundwater Risk Modeling
XVII	Ecological Risk Assessment
XVIII	Risk Characterization
XIX	Damage Cases
XX	Adequacy of State Regulations
XXI	Costs and Economic Impacts
XXII	Environmental Justice
XXIII	Incorporation by Reference

## **I. COAL COMBUSTION WASTES**

(includes comanaged utility, non-utility, and FBC wastes)

EPA tentatively concluded to retain the Bevill exemption for comanaged utility coal combustion wastes (UCCWs), non-utility coal combustion wastes, and fluidized bed combustion (FBC) wastes. Comments were received on both sides of this issue. Many industry, academic, state, and federal government commenters expressed support for the conclusion. Some of these commenters specifically cited the infrequency of exceedences of the toxicity characteristic as justification for this conclusion.

Public interest group, academic, and citizen commenters, on the other hand, suggested that the recommendation was incorrect or premature for a variety of reasons, and requested that the issue be reconsidered. A number of these commenters specifically requested that EPA require the risk mitigation alternative discussed in the Report to Congress. The specific reasons cited by these commenters for disagreeing with the recommendation included concerns about the completeness of the report and record, the adequacy of the Agency's waste characterization, the risks identified in the Report to Congress, the adequacy of the risk assessment process, the adequacy of EPA's consideration of damage cases, and the adequacy of existing state regulations. These specific concerns are summarized in greater detail under the other topic areas covered by this document

### *Response:*

Based on our collection and analysis of information reflecting the criteria in Section 8002(n) of RCRA that EPA must consider in making today's regulatory determination, materials developed in preparing the RTC and supportive background materials, existing state and federal regulations and programs that affect the management of coal combustion wastes, and comments received from the public on the findings we presented in the RTC, we have concluded the following:

#### *1. Beneficial Uses*

To the extent coal combustion wastes are used for beneficial purposes, we believe they should continue to remain exempt from being regulated as hazardous wastes under RCRA. Beneficial purposes include waste stabilization, beneficial construction applications (e.g., cement, concrete, brick and concrete products, road bed, structural fill, blasting grit, wall board, insulation, roofing materials), agricultural applications (e.g., as a substitute for lime) and other applications (absorbents, filter media, paints, plastics and metals manufacture, snow and ice control, waste stabilization). For the reasons presented in section 3 below, we are separately addressing the use of coal combustion wastes to fill surface or underground mines.

For beneficial uses other than minefilling, we have reached this decision because: (a) we have not identified any beneficial uses that are likely to present significant risks to human health or the environment; and (b) no documented cases of damage to human health or the environment have been identified. Additionally, we do not want to place any unnecessary barriers on the beneficial use of coal combustion wastes so that they can be used in applications that conserve natural resources and reduce disposal costs.

Disposal can be burdensome and fails to take advantage of beneficial characteristics of fossil fuel combustion wastes. About one-quarter of the coal combustion wastes now generated are diverted to beneficial uses. Currently, the major beneficial uses of coal combustion wastes include: construction (including building products, road base and sub-base, blasting grit and roofing materials) accounting for approximately 21%; sludge and waste stabilization and acid neutralization accounting for approximately 3%; and agricultural use accounting for 0.1%. Based on our conclusion that these beneficial uses of coal combustion wastes are not likely to pose significant risks to human health and the environment, we support increases in these beneficial uses of coal combustion wastes.

Off-site uses in construction, including wallboard, present low risk due to the coal combustion wastes being bound or encapsulated in the construction materials or because there is low potential for exposure. Use in waste and sludge stabilization and in acid neutralization are either regulated (under RCRA for hazardous waste stabilization or when placed in municipal solid waste landfills, or under the Clean Water Act in the case of municipal sewage sludge or wastewater neutralization), or appear to present low risk due to low exposure potential. While in the RTC, we expressed concern over risks presented by agricultural use, we now believe our previous analysis assumed unrealistically high-end conditions, and that the risk, which we now believe to be on the order of  $10^{-6}$ , does not warrant national regulation of coal combustion wastes that are used in agricultural applications.

In the RTC, we were not able to identify damage cases associated with these types of beneficial uses, nor do we now believe that these uses of coal combustion wastes present a significant risk to human health or the environment. While some commenters disagreed with our findings, no data or other support for the commenters' position was provided, nor was any information provided to show risk or damage associated with agricultural use. Therefore, we conclude that none of the beneficial uses of coal combustion wastes listed above pose risks of concern.

## *2. Disposal in landfills and surface impoundments*

In this section, we discuss available information regarding the potential risks to human health and the environment from the disposal of coal combustion wastes into landfills and impoundments. In sum, our conclusion is these wastes can pose significant risks when mismanaged and, while significant improvements are being made in waste management practices due to increasing state oversight, gaps in the current regulatory regime remain.

We have determined that the establishment of national regulations is warranted for coal combustion wastes when they are disposed in landfills and surface impoundments, because: (a) the composition of these wastes has the potential to present danger to human health and the environment under some circumstances and "potential" damage cases identified by EPA and commenters, while not definitively demonstrating damage from coal combustion wastes, lend support to our conclusion that these wastes have the potential to pose such danger; (b) we have identified eleven cases of proven damage to human health and the environment by improper management of these wastes when land disposed; (c) while industry management practices have improved measurably in recent years, there is sufficient evidence these wastes are currently being managed in a significant number of landfills and surface impoundments without proper controls in

place, particularly in the area of groundwater monitoring; and (d) while there have been substantive improvements in state regulatory programs, we have also identified significant gaps either in states' regulatory authorities or in their exercise of existing authorities. Moreover, we believe that the costs of complying with regulations that specifically address these problems, while large in absolute terms, are only a small percentage of industry revenues.

When we considered a tailored Subtitle C regulatory approach, we estimated the potential costs of regulation of coal combustion wastes (including the utility coal combustion wastes addressed in the 1993 Part 1 determination) to be \$1 billion per year. While large in absolute terms, we estimate that these costs are less than 0.4 percent of industry sales. Our preliminary estimate of impact on profitability is a function of facility size, among other factors. For the larger facilities, we estimate that reported pre-tax profit margins of about 13 percent may be reduced to about 11 percent. For smaller facilities, margins may be reduced from about nine percent to about seven percent.

We identified that the constituents of concern in these wastes are metals, particularly hazardous metals. We further identified that leachate from various large volume wastes generated at coal combustion facilities infrequently exceed the hazardous waste toxicity characteristic, for one or more of the following metals: arsenic, cadmium, chromium, lead, and mercury. Additionally, when we compared waste leachate concentrations for hazardous metals to their corresponding MCLs (or potential MCLs in the case of arsenic), we found that there was a potential for risk as a result of arsenic leaching from these wastes. The criteria we examined included the existing arsenic MCL, a lower health based number presented in the RTC, and two assumed values in between. We examined this range of values because, as explained earlier in this notice, EPA is in the process of revising the current MCL for arsenic to a lower value as a result of a detailed study of arsenic in drinking water and we wanted to assess the likely range of values that would be under consideration by EPA. Once we have completed a review of our groundwater model and made necessary changes, we will reevaluate the potential risks from metals in coal combustion wastes and compare any projected groundwater contamination to the MCLs that exist at that time.

We also identified situations where the improper management of mill rejects, a low volume and uniquely associated waste, with high volume coal combustion wastes has the potential to cause releases of higher quantities of hazardous metals. When these wastes are improperly managed, the mill rejects can create an acidic environment which enhances leachability and can lead to the release of hazardous metals in high concentrations from the co-managed wastes to ground water or surface waters. Thus, our analysis of the characteristics of coal combustion wastes leads us to conclude that these wastes have the potential to pose risk to human health and the environment. We also plan to address such waste management practices in our subsequent rulemaking.

Additionally, we identified 11 proven damage cases that documented disposal of coal combustion wastes in unlined landfills or surface impoundments that involved exceedences of primary MCLs or other health-based standards in ground water or drinking water wells. Three of the proven damage cases were on the EPA Superfund National Priorities List. Although these damage cases indicate that coal combustion wastes can present risks to human health and the environment, they also show the effectiveness of states' responses when damages were identified.

All of the sites were at older, unlined units, with disposal occurring prior to 1993. None of these cases involved actual human exposure. Given the large number of facilities that do not now conduct groundwater monitoring, we have a concern that additional cases of damage may be undetected.

As detailed in the RTC and explained earlier in this notice, we identified that the states and affected industry have made considerable progress in recent years toward more effective management of coal combustion wastes. We also identified that the ability for most states to impose specific regulatory controls for coal combustion wastes has increased almost three-fold over the past 15 years. Forty-three states can now impose a liner requirements at landfills whereas 15 years ago, 11 had the same authority. In addition to regulatory permits, the majority of states now have authority to require siting controls, liners, leachate collection, groundwater monitoring, closure controls, and other controls and requirements for surface impoundments and landfills.

Nonetheless, we have concluded that there are still gaps in the actual application of these controls and requirements, particularly for surface impoundments. While most states now have the appropriate authorities and regulations to require liners and groundwater monitoring that would reduce or minimize the risks that we have identified, we have also identified numerous situations where these controls are not being applied. For example, only 26 percent of utility surface impoundments and 57 percent of utility landfills have liner systems in place. We have insufficient information to determine whether the use of these controls is significantly different for non-utility disposal units, due to a small sample size.

While many of these unlined units may be subject to grandfathering provisions that allow them to continue to operate without being lined, or may not need to be lined due to site-specific conditions, we are especially concerned that a substantial number of units do not employ groundwater monitoring to ensure that if significant releases occur from these unlined units, they will be detected and controlled. In 1995, groundwater was monitored at only 38 percent of utility surface impoundments. While monitoring is more frequent at landfills, there are still many units at which releases of hazardous metals could go undetected. For example, of the approximately 300 utility landfills, 45 newer landfills (15 %) do not monitor ground water. We are concerned that undetected releases could cause exceedences of drinking water or other health-based standards that may threaten public health or groundwater and surface water resources. Thus, we conclude that national regulations would lead to substantial improvements in the management of coal combustion wastes.

### *3. Minefilling*

We have determined that the establishment of national regulations is warranted for coal combustion wastes when they are placed in surface or underground mines because: (a) we find that these wastes when minefilled have the potential to present a danger to human health and the environment, (b) minefilling of these wastes has been an expanding practice and there are few states that currently operate comprehensive programs that specifically address the unique circumstances of minefilling, making it more likely that any damage to human health or the environment would go unnoticed or unaddressed, and (c) we believe that the cost of complying with regulations that address these potential dangers may not have a substantial impact on this



practice because minefilling continues to grow in those few states that already have comprehensive programs.

We recognize that at this time, we cannot quantify the nature of damage that may be occurring or may occur in the future as a result of using coal combustion wastes as minefill. It is often impossible to determine if existing groundwater quality has been impacted by previous mining operations or as a result of releases of hazardous constituents from the coal combustion wastes used in minefilling applications. We have not as yet identified proven damage cases resulting from the use of coal combustion wastes for minefilling.

We also acknowledge that when the complexities related to site-specific geology, hydrology, waste chemistry and interactions with the surrounding matrix, and other relevant factors are properly taken into account, coal combustion wastes used as minefill can provide significant benefits. However, when not done properly, minefilling has the potential to contaminate ground water to levels that could damage human health and the environment. Based on materials submitted during the public comment period, coal combustion wastes used as minefill can lead to increases in hazardous metals released into ground water if the acidity within the mine overwhelms the capacity of the coal combustion wastes to neutralize the acidic conditions. This is due to the increased leaching of hazardous metals from the wastes. The potential for this to occur is further supported by data showing that management of coal combustion wastes in the presence of acid-generating pyritic wastes has caused metals to leach from the combustion wastes at much higher levels than are predicted by leach test data for coal combustion wastes when strongly acidic conditions are not present. Such strongly acidic conditions often exist at mining sites.

Although we have identified no damage cases involving minefilling, we are also aware of situations where coal combustion wastes are being placed in direct contact with ground water in both surface and underground mines. We concluded in our recent study of cement kiln dust management practices that placement of cement kiln dust in direct contact with ground water led to a substantially greater release of hazardous metals than we predicted would occur when the waste was placed above the water table. For this reason, we find that there is a potential for increased releases of hazardous metals as a result of placing coal combustion wastes in direct contact with groundwater. Also, there are damage cases associated with coal combustion wastes in landfills. The Agency believes it is reasonable to be concerned when similar quantities of coal combustion wastes are placed in mines, which often are not engineered disposal units and in some cases involve direct placement of wastes into direct contact with ground water.

We are concerned that government oversight is necessary to ensure that minefilling is done appropriately to protect human health and the environment, particularly since minefilling is a recent, but rapidly expanding use of coal combustion wastes. Government oversight has not yet “caught up” with the practice consistently across the country. There are some states that have programs that specifically address minefilling practices. We are likely to find that their programs or certain elements of their programs could serve as the basis for a comprehensive, flexible set of national management standards that ensure protection of human health and the environment. We also believe that these state programs will provide valuable experience in coordinating with SMCRA program requirements. However, at this time, few of the programs are comprehensive. Commenters pointed out, and we agree, there are significant gaps in other states. We believe that

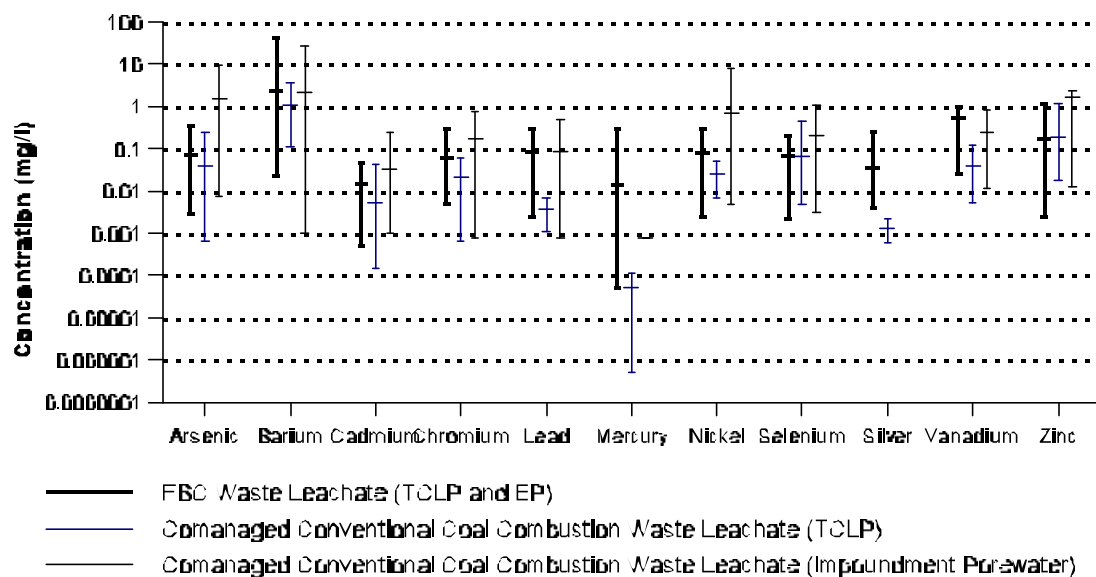
additional requirements for long-term groundwater monitoring, and controls on wastes placed directly into groundwater might be prudent.

*Fluidized Bed Combustion Wastes:* In response to issues raised concerning fluidized bed combustion (FBC) waste, these wastes are covered by the determination for coal combustion ash because these wastes are substantially similar to coal combustion wastes that result from conventional combustion technologies. A comparison of FBC data to other co-managed coal combustion wastes is presented in the following table. FBC data in the coal burner data base influenced our decision as much as conventional coal burner data.

In response to a comment urging EPA to designate FFC wastes covered by the Part 1 decision as hazardous, we believe that these wastes are substantially similar to the wastes covered by today's determination and therefore do not warrant Subtitle C regulation. However, we intend that the national regulations we develop for coal combustion wastes managed in landfills and surface impoundments and used for minefilling will also be applicable to those wastes covered by the Part 1 determination, so that all coal combustion wastes are consistently regulated for placement in landfills, surface impoundments, and minefills, for the following reasons:

- (1) The co-managed coal combustion wastes that we studied extensively in making today's regulatory determination derive their characteristics largely from these large-volume wastes and not from the other wastes that are co-managed with them.
- (2) We believe that the risks posed by the co-managed coal combustion wastes result principally from the large-volume wastes.
- (3) These large-volume wastes, on a dry basis, account for over 95% of coal combustion wastes

**Comparison of Facility Average Leachate Concentrations  
Fluidized Bed Combustion Waste versus Conventional Coal Combustion Waste**



## **I. COAL COMBUSTION WASTES**

### **Verbatim Commenter Statements**

The EPA Administrator and her staff are to be commended for the comprehensive evaluation that has already taken place with respect to many of the issues addressed in the Phase II Report. IEU supports the EPA tentative conclusions that coal-fired utility co-managed wastes should remain exempt from RCRA Subtitle C regulation. (IEU00018)

ARIPPA supports the tentative conclusion of the U.S. Environmental Protection Agency (EPA) to retain the exemption for disposal of co-managed and co-burning coal combustion waste at utilities; coal combustion wastes at non-utilities; petroleum coke combustion waste; and for fluidized combustion waste. ARIPPA recommends that EPA continue to retain exemptions. (ARIPP00019)

Based on our analyses and research of the issue, DOE supports maintaining the Bevill exemption for all fossil fuel combustion (FFC) wastes. (DOE00020)

PG&E Gen supports EPA's preliminary determination to retain the hazardous waste exemption for:

- fluidized bed combustion wastes;
- co-management of coal ash and coal pile runoff, boiler blowdown, cooling tower blowdown and sludge, regeneration waste streams, air heater and precipitator wash water, boiler chemical cleaning wastes, floor and yard drains/slumps, laboratory wastes, wastewater treatment sludge; (PG&E00023)

NMA supports EPA's tentative conclusion that disposal of these wastes should remain exempt from RCRA regulation. NMA urges EPA to adopt his position in the upcoming Regulatory Determination. (NMA00024)

The Department has worked closely with the Illinois Environmental Protection Agency in implementing the ACT and in our opinion the steps taken by ILLINOIS to address the disposal and use of CCW and CCB preclude the need for federal regulations in this area and that fossil fuel combustion wastes should retain their exemption from the hazardous waste regulations of RCRA. (ILDNR00026)

We respectfully ask that EPA not bow to pressure to extend the regulatory development timetable. It is time to put this issue to bed and allow us to move forward with the clean up of our scarred land. We also ask that the EPA base its decision on a fully informed process and sound science. In doing so, we are confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB, oil ash and mixtures of coal ash with other waste. (PAC00029).

On March 31, the Agency issued the "Report to Congress on Wastes from the Combustion of Fossil Fuels" in two volumes. In this report, the Agency has tentatively concluded that the disposal of coal-fired utility co-managed wastes should remain exempt from RCRA Subtitle C. New Century Energies and its operating companies, Public Service Company of Colorado (PSCo) and Southwestern Public Service Company (SPS) would like to affirm this conclusion and fully supports the Agency's position that continued use of site and region specific approaches by states

is more appropriate for addressing the limited health and environmental risks that may be associated with the wastes. (NCE00031)

We see no need for federal regulation under Subtitle C and believe the proper management of CCBs is a sound environmental practice. (NCE00031)

PCA also refers EPA to the voluminous technical information and comments submitted by the Pennsylvania Department of Environmental Protection (DEP), which show the Commonwealth's history of responsible management of these substances, and the resulting benefits of such use. This evidence clearly demonstrates that management of coal combustion wastes under the Resource Conservation and Recovery Act (RCRA) is unnecessary and counterproductive. (PCA00034)

Virginia Power fully supports the Agency's decision to exempt from RCRA Subtitle C requirements, co-managed wastes, which include petroleum coke combustion wastes, as well as mixtures of other fuels co-fired with coal. (VAP00042)

Virginia Power also fully supports the Agency's position to maintain the exemption of fluidized bed combustion wastes from RCRA Subtitle C Regulations.(VAP00042)

In general, APS is in agreement with EPA's recommendations in the RTC. We mostly seek to support the agencies tentative conclusions. In particular, we strongly support the tentative conclusion that comanaged wastes from coal-fired utilities should remain exempt from RCRA Subtitle C regulation. (APSC00043)

For the most part I, agree with EPA's overall conclusion that comanaged wastes are also generally not corrosive, reactive, ignitable, or toxic. The logical conclusion resulting from a detailed examination of these materials is that they should remain exempt from RCRA Subtitle C and that region-specific approaches by the states are appropriate. (EERC00044)

I am confident that the agency will see there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00045)

It appears that current regulation of these activities is more than adequate. Subtitle D regulatory authority should remain adequate for governing the management and beneficial use of CCPs in the future. (ISG00048)

TVA generally supports the conclusions of the RTC. (TVA00049).

EPA must base its decision on a fully informed process and sound science. In doing so I am confident that the Agency will see that there is no justification for expanding RCRA to include CFB coal ash with other wastes. (STR00050)

In its report, Environmental Protection Agency (EPA) made several tentative decisions to retain the exemption for the disposal of co-managed and co-burning coal combustion wastes at utilities, coal combustion wastes at non-utilities, petroleum coke combustion wastes; fluidized bed combustion wastes; and natural gas combustors. We agree and support these determinations. (CIBO00052)

TXU supports the general conclusion reached by EPA in the RTC that disposal of co-managed wastes generated at coal-fired utilities, including beneficial utilization, should remain exempt from the provisions of subtitle C of the Resource Conservation and Recovery Act (RCRA). (TXU00053)

TXU supports the general conclusion reached by EPA in the Report to Congress on Wastes from the Combustion of Fossil Fuels ("RTC") that disposal of co-managed wastes generated at coal-fired utilities should remain exempt from the requirements of subtitle C of the Resource Conservation and Recovery Act (RCRA). (TXU00053)

TXU concurs with EPA's tentative conclusion that non-utility coal combustion wastes and beneficial uses of such wastes should remain exempt from RCRA Subtitle C. (TXU00053)

AEP's experience supports EPA's tentative conclusions that Coal-Fired Utility Comanaged Wastes (i.e. CCPs) should remain exempt from RCRA Subtitle C regulation. (AEP00060)

The Maryland Coal Association appreciates the opportunity to make these comments on behalf of the existing exclusion of fossil fuel combustion by-products. (MDCAL0001)

I am highly pleased that following 18 years of study pursuant to the 1980 Beville Amendment to RCRA, EPA has finally concluded that electric utilities and independent power producers generally manage fossil fuel combustion wastes in an environmentally responsible manner and that the combustion wastes do not warrant hazardous waste regulations under RCRA. (BCHL0002)

DEP supports EPA's tentative conclusion that disposal of these wastes should remain exempt from RCRA regulation. DEP urges EPA to adopt this position in the upcoming Regulatory Determination. (WVDEPL0003)

The agency's tentative conclusion not to impose Subtitle C rules on the use and disposal of such CCPs is well-founded. (WVDEPL0003)

This evidence clearly demonstrates that management of coal combustion wastes under the Resource Conservation and Recovery Act (RCRA) is unnecessary and counterproductive. (PCA00034)

The data collected by EPA shows that neither oil ash nor fluidized-bed combustion wastes meet the criteria of hazardous wastes, and therefore do not warrant regulation under RCRA. Furthermore, an EPA determination that waste CFB (Circulating Fluidized Bed) waste and other ash byproducts are hazardous would have far reaching effects on Pennsylvania's taxpayers and the environment. Furthermore, the Agency's conclusion are not all supported by the technical data they themselves collected. (EPACAMR00248)

An EPA determination the CFB (circulating fluidized-bed) waste coal ash and other ash byproducts are hazardous would have far reaching effects on Pennsylvania's taxpayers and the state's environment. Not only that, but these conclusions are not all supported by the technical data gathered by the Agency. (PCLP00249)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so, I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PCLP00249)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (G&L00252)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00253)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash. (CIN00254)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (EPC00255)

PG&E Gen agrees with the tentative conclusions to exempt coal ash from regulation under Subtitle C of the Resource Conservation and Recovery Act ("RCRA"). (PG&E00274)

USWAG reiterates its recommendation that EPA issue a regulatory determination that all "remaining" FFC wastes do not warrant RCRA Subtitle C or similar regulation. (USWAG00275)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (FW00277)

As set forth in its initial comments, CIBO asserts that available scientific, analytic, demonstrative, and other data clearly sustain the conclusion that no aspect of the substances addressed in the RTC should be subjected to national Subtitle C regulation. Further, sound RCRA policy requires this outcome. CIBO asserts that all available data demonstrates that all wastes and applications covered by the RTC should remain under the Bevill exemption (CIBO00280)

I believe that we have amply and effectively demonstrated the successful balance between economic issues and the environmental concerns through adherence of the Pennsylvania regulations for CFB ash disposal and beneficial use and can see no benefit to the expansion of RCRA to include waste coal CFB ash and mixtures of coal ash with other fuel ash produced in a CFB. (GPC00297).

An EPA determination the CFB (circulating fluidized-bed) waste coal ash and other ash byproducts are hazardous would have far reaching effects on Pennsylvania's taxpayers and the state's environment. Not only that, but these conclusions are not all supported by the technical data gathered by the Agency. (KCC00298)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (KCC00298)

An EPA determination the CFB (circulating fluidized-bed) waste coal ash and other ash byproducts are hazardous would have far reaching effects on Pennsylvania's taxpayers and the state's environment. Not only that, but these conclusions are not all supported by the technical data gathered by the Agency. (SMC00299)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (SMC00299)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00300)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00301)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00302)

Please urge EPA to base its decision on careful scientific evidence. In doing so, I am confident that the EPA will reach the same the conclusions that Pennsylvania's DEP has already concluded on this matter. There is simply no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00305)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (ACV00307)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (TEGI00308)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00368)

I urge EPA to base its decision on a fully informed regulatory process and sound science. In doing so I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (AMI00372)



An EPA determination that CFB (circulating fluidized-bed) waste coal ash and other ash by-products are hazardous would have far reaching effects on Pennsylvania's taxpayers and the state's environment. (PAL0001)

The Commission opposes the U.S. Environmental Protection Agency's efforts to regulate waste coal ash as a hazardous waste as considered in EPA's second *Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants*. (ORBCL0002)

I concur that the electric generating industries generally manage fossil fuel combustion waste in a responsible manner and that the wastes do not represent a significant hazard requiring more stringent regulation. (LRCAXXXX)

Ash generated at PG&E Gen's FBC facilities does not exhibit any of the four hazardous waste characteristics that identify hazardous waste. With respect to toxicity, ash from PG&E Gen's facilities consistently test below the TCLP test leaching standards for RCRA constituents, including arsenic and mercury. FBC ash should not be regulated as a Subtitle C hazardous waste where the test data clearly show levels of contamination far below the RCRA hazardous waste definition standards. (PG&E00023)

Furthermore, EPA's data showed "no exceedances of TC levels in any TCLP [Toxicity Characteristic Leaching Procedure] sample of co-managed wastes, and ...only infrequent exceedances of TC levels *in situ* pore water samples from some impoundments." *Id.*, 3-2. This data again lead inescapably to the conclusion that coal-fired utility co-managed wastes did not warrant the imposition of Subtitle C hazardous waste rules. (NMA00024)

The data collected by EPA shows that neither oil ash nor fluidized-bed combustion wastes meet the criteria of hazardous wastes, and therefore do not warrant regulation under RCRA. Furthermore, an EPA determination that waste CFB (Circulating Fluidized Bed) waste and other ash byproducts are hazardous would have far reaching effects on Pennsylvania's taxpayers and the environment. Furthermore, the Agency's conclusion are not all supported by the technical data they themselves collected. (EPACAMR00248)

Indeed the analysis presented in the Report can only support a different Regulatory Determination—EPA has identified sufficiently significant risks to support a Regulatory Determination that the co-managed FFC wastes be regulated as RCRA Subtitle C wastes. (ALA00036)

We believe that the limited credible information in this Report as well as the extensive information demonstrating damages to the environment from these wastes unambiguously supports regulation for fossil fuel wastes as hazardous wastes under Subtitle C or RCRA. Accordingly we call upon EPA to designate all fossil fuel wastes including those covered in the first Bevil Determination as hazardous waste in its Final Determination.. (HEC00056)

The 49 undersigned local, regional, and national environmental and public health organizations urge the U.S. Environmental Protection Agency to reverse its pending decision to exempt fossil fuel combustion wastes from regulation under RCRA Subtitle C. (49CAO00058)

I think we need some kind of protection on the ground water, like liners, leachate collection systems, adequate ground water monitoring at each site to ensure that the CCW is disposed of in the right way, so that we won't be bothered with cancer or something else. (CITZ00257)

Analysis of CCW indicates that it would be properly regulated under Subtitle C of RCRA. (NPCA00259)

CCW needs to much more strictly regulated, and EPA should do its own studies. (CITZ00268)

I am writing to urge the EPA to strictly regulate the disposal of coal combustion waste (CCW). (CITZ00271)

We urge you to regulate CCW as the hazardous waste that recently available research shows it to be. (CITZ00271)

National regulations on the disposal of CCW such as requirements for liners, ground water monitoring, and leachate collection systems are essential for the protection of the environment. (SIERRA00278)

EPA should required the risk mitigation alternative discussed in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (SIERRA00278)

In regards to this matter, EPA should address long term impacts caused by CCW. (SOCM00279)

EPA should address Congress about the danger of not having any national regulations on the disposal of CCW. (SOCM00279)

Written enforcement rules and fines for companies or individuals who violate any part of the procedures and requirements for carry out CCW waste disposal operations, be approved by Congress and individual states, before any report or recommendations are acted upon by Congress. (SOCM00279)

EPA should recommend that Congress ban any future dumping of CCW in lagoons, surface impoundments, landfills, old stripmine sites, or any other CCW disposal sites. (SOCM00279)

No CCW waste disposal operation be conducted without public notice, public hearings, environmental impact studies, which involves full participation of the general public (community) being impacted by such operations. (SOCM00279)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating ground and surface water around the country. (KYC00285)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating ground and surface water around the country. (CIT00286)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating ground and surface water around the country. (CIT00287)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating ground and surface water around the country. (CIT00289)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating ground and surface water around the country. (CIT00290)

Based on this review, we believe that EPA's Draft Regulatory Determination (that co-managed FFC wastes should continue to be exempt from regulation under subtitle C of the Solid Waste Disposal Act/Resource Conservation and Recovery Act) is unwarranted, or at best premature. We continue to hold the view that the information included in the Report on the potential risks of damage to human health and the environment from current FFC waste management and disposal practices, and proposed reuse of these materials, can support only an Agency Determination that these wastes should be regulated under RCRA subtitle C. (ALA00292)

As a university specialist working in the area of water quality in SW Indiana, I feel that stronger placement, monitoring and containment regulations are needed to encourage proper disposal of CCW's. (PURD000294)

Tri-State Citizens Mining Network is asking the EPA for strict national standards for Coal Combustion Waste (CCW). (TRI00295)

Stand firm on protecting Indiana's water supplies from Coal Combustion Waste (CCW) contamination. Please fulfill the promise of the EPA and the pledge of the Clinton/Gore administration to protect our environment by adopting the strongest possible regulations for Coal Combustion Waste. (CITZ00303)

Given the overwhelming evidence of contamination from CCW it seems only logical to treat CCW as any other hazardous waste and regulate it under RCRA Subtitle C. (CITZ00303)

Among other prudent projections it seems only logical to do the following:

1. Separate CCW from our water supplies with liners. (CITZ00303)
3. Hold those who benefit from CCW disposal responsible for any damages it causes. It is the utilities and mine operators that should be financially responsible for damage cause by CCW dumping. Not taxpayers. (CITZ00303)

We strongly feel that such coal wastes, and mixed waste need regulation under RCRA, consistent with their hazardous nature. (PEACE00306)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000311)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000312)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000313)

As a resident of an area which will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000314)

As a resident of an area which will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000316)

I recommend that the federal government regulate the dumping of CCW as a hazardous waste. When disposed of, there should be a liner system, and monitoring systems in place. (CITZ00317)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000318)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000319)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000320)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000321)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000322)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000323)

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As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000325)

I am writing to ask that EPA enact federal regulations that will prevent CCW from contaminating ground water supplies. (CITZ00327)

At a minimum, we must have liner, close groundwater monitors and regulation under RCRA Subtitle C to protect us. More basically, there needs to be more resource recovery to prevent toxic chemicals etc. from being dumped in the first place. (CITZ00330)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent coal combustion waste (CCW) from contaminating my water supply. (CITZ000331)

We encourage the EPA to enact federal regulations that will prevent CCW from contaminating water supplies in the United States. (BUCK00333)

I and our members ask that EPA enact federal regulations that will prevent CCW from contaminating ground and surface water in North Carolina and around the country. (NCSEA00334)

We are asking that CCW be disposed of in a safe, common sense manner to prevent contamination. (NCSEA00334)

As citizens who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ00336)

All we are asking is that CCW is disposed of in a safe, common sense manner to prevent contamination. People should not have to worry about the water that comes out of their tap. This is 1999 not 1899. WAKE UP! (CITZ00336)

I am writing to ask that EPA enact federal regulations that will prevent coal combustion waste (CCW) from contaminating the water supply in the state of Indiana and, indeed, the United States of America. (CITZ00339)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000340)

Minimum Federal Regulations are essential to protect me from these wealthy powerful entities. (CITZ00342)

I am all for any regulations governing the handling of and disposal of Coal Combustion Waste properly. (CITZ00342)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000343)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000344)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000345)

I urge the EPA to enact federal regulations that prevent coal combustion waste from contaminating ground and surface water in the future. (CITZ00346)

I am writing to urge the EPA to strictly regulate the disposal of coal combustion waste (CCW). (CITZ00347)

We urge you to regulate CCW as the hazardous waste that recently available research shows it to be. (CITZ00347)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000348)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000350)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000351)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000352)

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As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000355)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000356)

As a citizen who will be greatly affected by the EPA's regulatory determination on fossil fuel combustion wastes, I'm writing to ask that EPA enact federal regulations that will prevent CCW from contaminating my water supply. (CITZ000357)

EPA should go beyond a suggestion and require that CCW AS A HAZARDOUS WASTE BE REGULATED UNDER OUR HAZARDOUS WASTE LAWS. (CITZ00358)

This letter is a request for detailed and stringent regulation regarding the disposal of Coal Combustion Waste in America. (DCCC00359)

The long lasting detrimental effect of CCW disposal on ground and surface wasters is something we never want to see in Virginia. (DCCC00359)

We ask you to find that CCW is a hazardous or toxic waste and that it must be handled and disposed of as such. We also support your risk mitigation alternative for CCW disposal sites. (DCCC00359)

Please reject the proposed coal combustion waste rule and support the strongest possible regulation of coal combustion waste. Please protect our groundwater by requiring proper linings. (CITZL0008)

Please issue a national rule requiring that action be taken to protect our drinking water. (CITZL0011)

The EPA report (as it stood several months ago) would give the green light for other types of wastes involved in the production or burning of coal to being "comanaged" with CCW. That's a rotten idea. (CITZL0013)

EPA should require the risk mitigation alternative discussed in its draft report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (CITZ00256)

EPA should require the risk mitigation alternative discussed in its report to Congress for lagoons, surface impoundment, landfills, and all other CCW disposal sites. (VWI00258)

Fourthly, EPA should require the risk mitigation alternative described in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW sites. (CITZ00261)

EPA should require the risk mitigation alternative discussed in its report to Congress for lagoons, surface impoundments, landfills, and other CCW disposal sites. (CITZ00263)

EPA should require the risk mitigation alternative discussed in its report to Congress for lagoons, surface impoundments, landfills, and other CCW disposal sites. (CITZ00264)

EPA should require the risk mitigation alternative discussed in its report to Congress for lagoons, surface impoundments, landfills, and other CCW disposal sites. (SAVV00266)

All other disposal sites [other than mine disposal] should be assessed for the proper risk mitigation alternatives. (CITZ00267)

EPA should required the risk mitigation alternative discussed in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (SIERRA00278)

At a minimum, EPA should require the risk mitigation alternative described in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (CITZ00284)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners, leachate collection systems and ground water monitoring wells capable of detecting contamination before it becomes a problem should be basic common sense. (KYC00285)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners, leachate collection systems and ground water monitoring wells capable of detecting contamination before it becomes a problem should be basic common sense. (CIT00286)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners, leachate collection systems and ground water monitoring wells capable of detecting contamination before it becomes a problem should be basic common sense. (CIT00287)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners, leachate collection systems and ground water monitoring wells capable of detecting contamination before it becomes a problem should be basic common sense. (CIT00289)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners, leachate collection systems and ground water monitoring wells capable of detecting contamination before it becomes a problem should be basic common sense. (CIT00290)



Tri-State is asking the EPA to require the risk mitigation alternative described in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (TRI00295)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00311)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00312)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00313)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00314)

The EPA should require the risk mitigation alternative described in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (CITZ00315)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00316)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00318)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00319)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00320)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00321)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00322)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00323)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00324)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00325)

EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00327)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00331)

We ask that at a minimum, the risk mitigation alternative outlined in the draft Determination be applied nationally to all disposal sites for CCW and other fossil fuel combustion wastes, waste mixed with these wastes or wastes whose parent materials are coburned with these wastes. We believe that the requirements for liners, leachate collection and ground water monitoring outlined under this alternative in the Determination are basic projections that must be afforded to the environment and/or citizens who live adjacent to or near sites where these wastes are disposed. (HEC00332)

The EPA should require the risk mitigation alternative described in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (BUCK00333)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners, leachate collection systems and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (NCSEA00334)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners systems and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00336)

Also, the EPA should require the risk mitigation alternative described in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (CITZ00337)

In the upcoming report to Congress, the EPA should require that the risk mitigation alternative be used at all CCW disposal sites including landfills, surface impoundment's and lagoon. In the name of public safety, EPA should requires the installation of liners and long-term monitoring systems to protect the nearby aquifers and potential water systems of nearby residents. (CITZ00338)

In its draft report to Congress, the EPA should require that the risk mitigation alternative be used all CCW disposal sites including landfills, surface impoundment's, and lagoons. In my opinion, a common sense concern for safety of our groundwater supply requires the installation of liners and groundwater monitoring systems that would detect contamination before it becomes a problem be mandated. (CITZ00339)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00340)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00343)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00344)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00345)

At a minimum, EPA should require the risk mitigation alternative described in its draft report to Congress for lagoons, surface impoundment's, landfills, and all other CCW disposal sites. (CITZ00346)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00348)

EPA should require the risk mitigation alternative discussed in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (CITZ00349)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00350)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00351)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00352)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00353)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem, should be common sense. (CITZ00354)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00355)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00356)

At a minimum, EPA should require the risk mitigation alternative in its draft report to Congress to be employed for lagoons, surface impoundments, landfills, and all other CCW disposal sites. Installing liners and groundwater monitoring systems capable of detecting contamination before it becomes a problem should be basic common sense. (CITZ00357)

We ask you to find that CCW is a hazardous or toxic waste and that it must be handled and disposed of as such. We also support your risk mitigation alternative for CCW disposal sites. (DCCC00359)

At a minimum, EPA should require the risk mitigation alternative in its draft report to congress to be employed for lagoons, surface impoundment's, landfills, and all other CCW disposal sights. (CITZ00360)

At a minimum, EPA should require the risk mitigation alternative in its draft report to congress to be employed for lagoons, surface impoundment's, landfills, and all other CCW disposal sights. (CITZ00361)

At a minimum, EPA should require the risk mitigation alternative in its draft report to congress to be employed for lagoons, surface impoundment's, landfills, and all other CCW disposal sights. (CITZ00362)

At a minimum, EPA should require the risk mitigation alternative in its draft report to congress to be employed for lagoons, surface impoundment's, landfills, and all other CCW disposal sights. (CITZ00363)

At a minimum, EPA should require the risk mitigation alternative in its draft report to congress to be employed for lagoons, surface impoundment's, landfills, and all other CCW disposal sights. (CITZ00364)

At a minimum, EPA should require the risk mitigation alternative in its draft report to congress to be employed for lagoons, surface impoundment's, landfills, and all other CCW disposal sights. (CITZ00365)

At a minimum, EPA should require the risk mitigation alternative in its draft report to congress to be employed for lagoons, surface impoundment's, landfills, and all other CCW disposal sights. (CITZ00366)

At a minimum, EPA should require the risk mitigation alternative in its draft report to congress to be employed for lagoons, surface impoundment's, landfills, and all other CCW disposal sights. (CITZ00367)

EPA should ensure the objectivity, accuracy, and completeness of this report by ... requiring the risk mitigation alternative discussed in its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites. (POW00369)

One more point–The EPA should require the risk mitigation alternative discussed its report to Congress for lagoons, surface impoundments, landfills, and all other CCW disposal sites.  
(CITZL0013)

## **II. OIL COMBUSTION WASTES**

In the Report to Congress, EPA indicated that it was tentatively considering addressing the potential risks associated with management of oil combustion wastes (OCWs) either using Subtitle C regulatory authority or by encouraging voluntary changes in industry practices. Comments were received on both sides of this issue. Many industry and state and federal government commenters supported continuing to exclude OCW disposal from Subtitle C regulation under the Bevill amendment. Two of the commenters specifically supported continuing the exclusion for both utility and non-utility OCWs. One of the commenters supported voluntary controls and suggested that EPA cooperate with states to encourage these. Others argued that voluntary controls were unnecessary, given the infrequency of toxicity characteristic exceedences, the lack of documented damage cases, current industry practices, current state regulations, the small number of facilities, and small quantity of waste generated. One of these commenters suggested that even if lining of OCW impoundments was justified, a single liner, rather than a composite liner, would be adequate.

Public interest group commenters, on the other hand, argued that voluntary controls would be inadequate and recommended Subtitle C regulation, given current state regulations, the risks identified in the Report to Congress, the low cost of control, and the identification of a damage case associated with OCWs. One of these commenters proposed that a better approach would be to promulgate regulations and offer a delayed compliance schedule to facilities entering a voluntary early reduction program.

A number of industry and public interest group commenters also submitted detailed critiques of EPACMTP, the model used for analysis of potential groundwater risks.

Response: In the RTC, we identified that our only concern about oil combustion wastes was based on the potential for migration of arsenic, nickel, and vanadium from unlined surface impoundments. We requested information on this issue and did not receive any additional data and/or information to refute our tentative finding stated in the RTC that these unlined surface impoundments could pose a significant risk.

We are carefully reviewing all of the comments on the model and have determined that the process of thoroughly investigating all of the comments will take substantially more time to complete than is available within the court deadline for issuing this regulatory determination. (See Section XV for a more thorough discussion of comments and responses on groundwater risk modelling.) At this time, we are uncertain of the overall outcome of our analysis of the issues raised in the comments. Accordingly, we have decided not to use the results of our ground water pathway risk analysis in support of today's regulatory determination on fossil fuel combustion wastes. As explained below, we believe that actions have been taken or are under way by specific companies and/or the state Massachusetts to address potential risks at the six impoundments that we have been able to identify. Therefore we believe that further groundwater analysis is unnecessary at this time.

Meanwhile, we will continue with our analysis of comments on the groundwater model and risk analysis. This may involve changing or re-structuring various aspects of the model, if appropriate. It may also include additional analyses to determine whether any changes to the model

or modeling methodology would materially affect the groundwater risk analysis results that were reported in the RTC. If our investigations reveal that a re-analysis of groundwater risks is appropriate, we will conduct the analysis and re-evaluate today's decisions as warranted by the reanalysis.

As stated in the RTC, there are only six sites involving two utility companies that have unlined surface impoundments. Four of the sites are in Florida and are operated by one company. The company operating four the unlined impoundments in Florida is undertaking projects to mitigate potential risks posed by their unlined management units. At a May 21, 1999 public hearing, the company announced its plans to remove all the oil ash and basin material from its unlined impoundments and to line or close the units. The company informed us in January 2000 that it had completed the lining of all the units. Based on this information, we do not believe that these units pose a significant risk to human health and the environment. According to USWAG's comments, a seventh site in Florida no longer places OCWs in its unlined impoundment. The unlined impoundment remains subject to ground-water monitoring, and the monitoring shows a consistent pattern of compliance with the applicable ground-water protection standards at the point of compliance with a downward concentration trend since OCW placement in that unit ended in 1998.

The other two sites with unlined impoundments are operated by one utility in Massachusetts. Both sites are permitted under Massachusetts' ground water discharge permit program and have monitoring wells around the unlined basins. Arsenic is monitored for compliance with state regulations. Although the company expressed no plans to line their impoundments, they are preparing to implement monitoring for nickel and vanadium in ground water around the waste management units. Massachusetts maintains an MCL for arsenic of 0.05 mg/L. Massachusetts' MCL for nickel was remanded, but the State maintains a guideline concentration of 0.1 mg/L for nickel. Therefore, Massachusetts' regulatory program already provides some degree of control on these unlined impoundments with regard to arsenic and nickel. The State has no standard or guideline for vanadium. We have been working with the State and the company to obtain additional information to evaluate these two management units. We will continue this effort and will work with the company and the State to ensure that any necessary measures are taken so that these wastes are managed in a manner that protects human health and the environment.

Based on further discussions with the company, the monitoring wells surrounding the unlined units are sampled on a quarterly or monthly basis for inorganics, metals, and organic compounds under three separate monitoring plans filed with three separate regulating agencies. The company also is in the process of preparing a single, universal monitoring plan, to go into effect in late 1999, that meets the needs of the three regulating agencies. Since the publication of the Report to Congress, PG&E Generating has provided EPA with the results of recent years of monitoring at the sites. These monitoring data have been included in the public record.<sup>3</sup>

Concerning the occurrence of oil combustion waste surface impoundments at industrial or other non-utility facilities; during development of the Report to Congress we consulted with the

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<sup>3</sup> FF2P-S0429.



Council of Industrial Boiler Operators (CIBO), who represent non-utility fossil fuel burning facilities. CIBO did not identify any oil ash surface impoundments. We believe that non-utility boilers are too small in size to generate sufficient waste to manage in a surface impoundment dedicated only to those wastes. Such facilities are more likely to manage oil ash wastes in landfills. If they use surface impoundments it is likely that the oil ash is combined with other non-fossil fuel wastes. In addition, two commenters, both industry trade associations, submitted information concerning the likelihood of non-utility combustors managing OCW in unlined surface impoundments. Both commenters believed there were not a significant number of unlined impoundments managing OCW in the non-utility sector. This is consistent with the results of our research in the Report to Congress, which failed to identify any surface impoundments (lined or unlined) managing OCWs in the non-utility sector.

One commenter, an industry trade association objected to the Agency's suggestion that oil ash basins should have a composite liner and leachate collection system and further objected to the Agency even considering supplanting state ground-water policy through imposition of a liner requirement. For purposes of the RTC, we selected liners as a means to determine costs associated with potential management options to address identified risks. As demonstrated by today's decision and our ongoing coordination with the State of Massachusetts, we continue to rely on state regulation of ground-water protection for these wastes.

We have determined that it is not appropriate to establish national regulations applicable to oil combustion wastes because: (a) we have not identified any beneficial uses that are likely to present significant risks to human health or the environment; and (b) except for unlined surface impoundments, we have not identified any significant risks to human health and the environment associated with other waste management practices. As explained in the previous section, we intend to work with the State of Massachusetts and the owners and operators of the remaining two oil combustion facilities that currently manage their wastes in unlined surface impoundments to ensure that any necessary measures are taken so that their wastes are managed in a manner that protects human health and the environment.

## **II. OIL COMBUSTION WASTES**

### **Verbatim Commenter Statements**

Additional regulation of oil combustion management practices is unwarranted. (PG&E00023)

Managing oil combustion wastes as hazardous wastes is inappropriate for the following reasons:

- Oil combustion wastes typically do not exhibit the characteristics of hazardous waste;
- Oil combustion wastes comprise a very small volume of fossil fuel combustion wastes generated;
- The PG&E Gen oil ash management areas are adjacent to surface water bodies. There are no drinking water receptors at or near the PG&E Gen oil ash management sites;
- There is a significant amount of groundwater quality at our plant sites because state discharge permits require quarterly groundwater monitoring adjacent to the ash impoundments. Groundwater is monitored for metals, inorganics, and selected organics. Current data from ash management activities indicate there are no adverse impacts to the environment.
- Current ash management and disposal technologies have greatly improved over the past 20 years. (PG&E00023)

The two PG&E Gen oil combustion sites were described in EPA's March 1999 Report to Congress. Both sites use solids settling basins for treatment of oil ash and other low volume, non-hazardous waste. These sites dispose of solids from the basins to lined landfills. Both of these sites are regulated under the state groundwater discharge permit program, and both have monitoring wells around the unlined basins to determine groundwater quality. The monitoring wells around the unlined basins for inorganics, metals and organic compounds. There are no drinking water receptors impacted by these sites. In the event there are unacceptable impacts to human health or the environment from our unlined basins, PG&E Gen is prepared to take appropriate actions to mitigate the unacceptable risks. (PG&E00023)

In addition to the solids settling basins, PG&E Gen has one facility in Massachusetts with on-site, lined oil ash landfills. All landfills are lined, and the closed landfill cells are capped with PVC liners. There are two active, double-lined oil combustion waste landfills. Each landfill is approximately 1.5 acres in size, and there are groundwater monitoring wells around the active, and the closed landfills. As required by operating permits and state solid waste regulations, the groundwater is monitored around the closed landfills three times per year for metals, and on a quarterly basis around the active landfill cells for metals, inorganics, and selected organic compounds. In a recent review of site conditions, it has been determined that the landfills are not leaking or adversely impacting the environment. (PG&E00023)

Oil combustion wastes should not be regulated as hazardous wastes. As EPA notes in Volume II of the Report to Congress, oil combustion wastes typically do not exhibit hazardous characteristics. In addition, there is little evidence that there are unacceptable risks at sites with current industry practices. There is not the weight of evidence at our sites or others to warrant regulation of oil combustion wastes under Subtitle C. (PG&E00023)

In doing so, we are confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB, oil ash and mixtures of coal ash with other waste. (PAC00029)

In most respects, USWAG concurs with EPA's recommendations and findings regarding oil combustion wastes ("OCWs")... EPA's recommendation that OCWs (either managed as waste or beneficially used) generally do not warrant Subtitle C regulation is fully supported by the record. The characterization data show that OCWs rarely exhibit hazardous characteristics - roughly six percent of the samples in the record. This de minimis level of samples is about the same as EPA found in 1993 in the Beville regulatory determination on the four high volume coal combustion wastestreams. (USWAG00037)

The record is also clear that the risk of groundwater contamination is minimal. First, OCW management units are typically located near large surface water bodies, such as in Florida, the Atlantic Ocean or the Gulf of Mexico. 144 EPA found no examples of drinking water contamination or other environmental damage down gradient between the OCW management unit and the surface water body. It is also quite probable that the groundwater adjacent to these large salt water bodies is itself brackish and hence unfit for drinking water consumption. It is also highly significant that despite the many years of OCW management in a number of regions of the country, EPA was able to identify only one proven damage case at Possum Point, Virginia. (USWAG00037)

The crucial point is that OCW management is actively regulated by the states and EPA has correctly concluded that as a general rule these wastes require no additional regulation under Subtitle C of RCRA. (USWAG00037)

EPA has not justified its recommendation to consider either tailored Subtitle C regulations for unlined surface impoundments or encouraging voluntary changes to industry practices. Despite our overall concurrence with EPA's recommendation on OCWs, USWAG believes that EPA has failed to justify its recommendation to achieve lining of the existing universe of unlined OCW surface impoundments either through regulatory requirement or inducement of voluntary industry action. (USWAG00037)

In the utility industry sector, there may be as few as seven affected sites, four of which are owned by a single company, FPL. This company formally announced at the EPA Public Hearing on May 21, 1999, that it had already made the business decision to remove all the oil ash and basin material from its unlined impoundments and to line these units. As the company's representative at the hearing stated, "Three of the units will continue to manage oil ash while the fourth unit will be converted into a lined storm-water management basin." (USWAG00037)

Two Massachusetts sites with unlined basins were recently acquired by U.S. Generating Company (now PG&E Generating) from New England Electric System. According to that company's representative at the hearing, these basins are permitted by the Commonwealth of Massachusetts under that state's groundwater discharge permit program and are subject to groundwater monitoring requirements at those sites. There are no drinking water receptors at those locations, and PG&E Generating is committed "to take appropriate actions to mitigate [any] unacceptable risks" to human health and the environment from those basins. (USWAG00037)

The last site with an unlined impoundment is owned by Florida Power Corporation ("FPC"). That company has authorized USWAG to inform EPA that it no longer places OCWs in that impoundment. Rather, FPC stores its OCWs in on-site rolloff containers, and when sufficient quantities of OCWs are collected, the OCWs are transported to a commercial lined landfill for permanent disposal. The unlined impoundment remains subject to groundwater monitoring under the permit issued by the Florida Department of Environmental Protection ("DEP"), and the monitoring shows a consistent pattern of compliance with the applicable groundwater protection standards at the point of compliance with a downward concentration trend since OCW placement in that unit ended in 1998. (USWAG00037)

Although we do not have precise data on the non-utility units that manage OCWs, we believe the probability that there are any significant number of such unlined units in that sector is quite small. Given the competing pressures within EPA for scarce agency resources, we cannot seriously believe that EPA would commence a Subtitle C rulemaking that might affect as few as two facilities.

To the extent there exists any problem - it appears to be wholly a function of EPA's flawed modeling - this problem is small to begin with and is likely to diminish and perhaps even disappear in the next few years. (USWAG00037)

Second, it is far from clear that these unlined basins pose any significant environmental problem. EPA has not identified any proven damage cases stemming from management of oil ash at any unlined basin and the RTC correctly notes that these impoundments are close to large surface water bodies such as the Atlantic Ocean and estuaries and no drinking water wells are located between the units and the surface water body. (USWAG00037)

Third, as EPA acknowledges, these impoundments are not unregulated units. In Florida, for example, these units, known as percolation basins, are permitted by the Florida DEP under Florida law, and as we described with respect to the FPC unit above, they must comply with groundwater standards at a specified point of compliance outside the zone of discharge. Florida's policy in this respect is analogous to the 150 meter point of compliance for groundwater compliance in EPA's Part 258 municipal solid waste landfill rules. In addition, all four of FPL's percolation basins have a graded lime rock floor to chelate any leachable metals prior to percolation, and all of these units have groundwater monitoring to ensure compliance with state groundwater standards. (USWAG00037)

Fourth, even if there was a case for lining these units, we do not agree with EPA's suggestion that the management of oil ash in basins should include the use of composite liners with leachate collection systems. Such an elaborate liner system, characteristic of a Subtitle D municipal landfill, is more elaborate than necessary for a temporary storage area ... The purpose to be served by the proposed leachate collection system is unclear in the RTC. Is the leachate collection system intended to detect liner leaks, or is it intended to collect leachate for treatment prior to discharge? The physical properties of oil ash do not lend themselves to this method of wastewater treatment. In the case of oil ash settling basins, the basins are cleaned out periodically, which allows visual inspection of the liner to evaluate it for defects. If a damaged area is discovered it can be repaired prior to returning the basin back to service. Given this management practice, a single liner for an ash basin should be sufficient. (USWAG00037)

And finally, given EPA's strong policy of deference to state groundwater decision-making, we fail to understand why EPA in this instance is even considering supplanting state groundwater policy for what amounts to a Federally-imposed zero-discharge policy through imposition of a liner requirement. Such an inflexible requirement goes well beyond the options EPA is considering in the Industrial Solid Waste Guidance Document. (USWAG00037)

In sum, the tailored Subtitle C option that EPA proposed in the RTC for addressing its concerns with the unlined percolation basins would be a classic case of regulatory overkill - a Federal solution to overrule and disregard state primacy in groundwater management policy to solve an environmental problem whose existence has not been established and for which EPA admits there is no evidence of environmental damage. (USWAG00037)

Virginia Power supports EPA's encouragement of voluntary changes in industry practices. The Company does not support establishing RCRA Subtitle C requirements for the management of oil combustion wastes. (VAP00042)

Therefore, Virginia Power supports the solicitation of industry practices at the state level. The establishment of RCRA Subtitle C requirements for one oil combustion unit would prove to be overkill for the management of a site. This would be a prime opportunity for the development of a partnership comprised of governing agencies, facilities that have instituted various voluntary industry practices, and representatives from the oil combustion waste site that need to address site specific concerns. To this end, Virginia Power recommends the Agency request the states governing the oil waste combustion sites to obtain industry practices from known sites, and coordinate efforts to address site issues. (VAP00042)

I am confident that the Agency will see there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00045)

TVA generally supports the conclusions of the RTC. (TVA00049)

CIBO disagrees with any suggestion in the RTC that some regulation under Subtitle C may be necessary for mine reclamations/minefill applications, use of fossil fuel combustion ash for agricultural purposes, and oil ash disposal. CIBO submits that data -- and sound RCRA policy -- support the conclusion that no aspect of these substances warrants subjecting them to national Subtitle C regulation in any form. CIBO disagrees with any suggestion that national regulation should supplant or duplicate State regulation, for sound policy and practical reasons. (CIBO00052)

At this time, ash from oil burning is typically not separately collected and is, therefore of little concern to the industrial community. Natural gas and coal are the primary fuels of industry today. Given the slim and decreasing use of this fuel in the industrial sector, in the very rare case where oil ash is collected, it is expected to be handled offsite in lined landfills. We do not believe there is any need to develop new national regulations or classifications for industrial combustion ash or by-products from the combustion of oil. We believe current regulations and State management programs are sufficient to protect human health and the environment. (CIBO00052)

TXU concurs with EPA's recommendations and findings regarding oil combustion wastes ("OCWs"). (TXU00053)

TXU believes that EPA's recommendation that OCWs (either managed as waste or beneficially used) generally do not warrant Subtitle C regulation is fully supported by the record. (TXU00053)

The commenters support of EPA's conclusion to retain the Bevill exclusion for oil and natural gas. (WVA00059)

The Maryland Coal Association appreciates the opportunity to make these comments on behalf of the existing exclusion of fossil fuel combustion by-products. (MDCAL0001)

I am highly pleased that ... EPA has finally concluded that electric utilities and independent power producers generally manage fossil fuel combustion wastes in an environmentally responsible manner and that the combustion wastes do not warrant hazardous waste regulation under RCRA. (BCHRL0002)

The data collected by EPA shows that neither oil ash nor fluidized-bed combustion wastes meet the criteria of hazardous wastes, and therefore do not warrant regulation under RCRA. (EPACAMR00248)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PCLP00249)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (G&L00252)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00253)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash and mixtures of coal ash with other waste. (EPC00255)

The oil ash exemption should be continued; EPA's concern regarding management in unlined landfills is adequately addressed by current case-by-case monitoring and control programs that have been established by state environmental programs, making regulation under RCRA's Subtitle C regulations superfluous. (PG&E00274)

USWAG reiterates its recommendation that EPA issue a regulatory determination that all "remaining" FFC wastes do not warrant RCRA Subtitle C or similar regulation. (USWAG00275)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (FW00277)

CIBO asserts that available scientific, analytic, demonstrative, and other data clearly sustain the conclusion that no aspect of the substances addressed in this RTC should be subjected to national

Subtitle C regulation. ... CIBO asserts that the available data demonstrates that all wastes and applications covered by the RTC should remain under the Bevill exemption. (CIBO00280)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (KCC00298)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste (PA00300)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash and mixtures of coal ash with other waste. (PA00301)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00302)

I am confident that the EPA will reach the same conclusions that Pennsylvania's DEP has already concluded on this matter. There is simply no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00305)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (ACV00307)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (TEGI00308)

I am confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (PA00368)

I am confident the ARCTICS will see that there is no justification for expanding RCRA to include waste coal CFB ash, oil ash, and mixtures of coal ash with other waste. (AMI00372)

The Agency clearly must make findings that Subtitle C regulation of oil combustion wastes is appropriate and necessary. First, there is a demonstration of clear public health hazards from current disposal practices of these wastes (as summarized on page 6-1). Second, the Agency found that state agencies have few, if any, requirements for oil combustion waste management units and in fact some allow discharges to groundwater from these units. Third, the Agency found that the costs of control represent less than one-tenth of one percent of the value of sales. Lastly, the Agency asks for identification of a single damage case. However, the Agency has already identified a damage case from these units. Clearly the Agency should exercise its RCRA authority for these units. To rely on an unspecified voluntary proposal from industry is unacceptable. (ALA00036)

We believe that the limited credible information in this Report as well as the extensive information demonstrating damages to the environment from these wastes unambiguously supports regulation of fossil fuel wastes as hazardous wastes under Subtitle C of RCRA. Accordingly, we call upon EPA to designate all fossil fuel wastes including those covered in the first Bevill Determination as hazardous waste in its Final Determination. (HEC00056)

The 49 undersigned local, regional, and national environmental and public health organizations urge the U.S. Environmental Protection Agency to reverse its pending decision to exempt fossil fuel combustion wastes from regulation under RCRA Subtitle C. (49CAO00058)

We request that US EPA regulate fossil fuel wastes including coal combustion wastes to be disposed in mines as a hazardous waste under RCRA subtitle C. We ask that at a minimum, the risk mitigation alternative outlined in the draft Determination be applied nationally to all disposal sites for CCW and other fossil fuel combustion wastes, wastes mixed with these wastes or wastes whose parent materials are coburned with these wastes. (HEC00332)



### **III. NATURAL GAS COMBUSTION WASTES**

Those that commented specifically on this issue supported EPA's conclusion to retain the exemption for natural gas combustion waste. One industry association encouraged EPA to foster the use of natural gas. While some public interest group commenters disagreed broadly with EPA's conclusions about retaining the exemption for fossil fuel combustion (FFC) wastes generally, they did not address natural gas combustion waste specifically.

Response: The burning of natural gas generates virtually no solid waste. We, therefore, believe that there is no basis for EPA developing hazardous waste regulations applicable to natural gas combustion facilities.

### **III. NATURAL GAS COMBUSTION WASTES**

#### **Verbatim Commenter Statements**

PG&E Gen supports EPA's preliminary determination to retain the hazardous waste exemption for: natural gas combustion wastes. (PG&E00023)

Given the Bevill Amendment's criteria for issuing a regulatory determination, EPA has arrived at the only conceivable recommendation for natural gas combustion wastes: 'that [Subtitle C] regulations are unwarranted.' USWAG fully concurs with EPA's recommendation. (USWAG00037)

In its report, Environmental Protection Agency (EPA) made several tentative decisions to retain the exemption for: the disposal of co-managed and co-burning coal combustion wastes at utilities, coal combustion wastes at non-utilities, petroleum coke combustion wastes; fluidized bed combustion wastes; and natural gas combustors. We agree and support these determinations. (CIBO00052)

IOGA and WVONGA support EPA's recommendation on wastes from natural gas; that is: 'The Agency has tentatively concluded that it will retain the Subtitle C exemption for natural gas combustors.' The associations would prefer, of course, that the agency permanently conclude that the Subtitle C exemption be retained for natural gas combustion. As the agency states, "Because of its negligible ash content, combustion of natural gas generates virtually no solid waste." It is only logical, and environmentally sound, to retain the Subtitle C exemption for natural gas combustion "since there are no solid wastes generated by the process." In sum, IOGA and WVONGA strongly support the Bevill Amendment for wastes, if any, from the combustion of natural gas. (WVA00059)

In summary, IOGA and WVONGA encourage EPA to foster the use of natural gas and electric generation and industrial facilities by encouraging the following:

1. Co-firing: natural gas mixed with coal or oil which reduces emission of SO<sub>2</sub> and Nox;
2. Re-burning: using natural gas injected into a boiler to "re-burn" emissions reducing Nox.
3. Fuel switching: substitute natural gas for other combustion fuels during warm weather months when smog generation is at its highest; and
4. Co-generation: utilizing natural gas to also generate steam for resale. In some natural gas fired power plants and utilization of natural gas in combination with other fossil fuels reduces the emission of pollutants into the atmosphere. (WVA00059)

We support EPA's conclusion that the combustion of natural gas does not produce solid wastes and, therefore, should be exempt from RCRA regulation. In addition, the facts clearly point out that natural gas is superior to other fossil fuels in the pollution attributed to energy generation in terms of emissions and waste disposal. As the American Gas Association states: natural gas is "America's Natural Wonder." We encourage EPA to promote the use of the cleanest burning fuel, natural gas. (WVA00059)

USWAG reiterates its recommendation that EPA issue a regulatory determination that all "remaining" FFC wastes do not warrant RCRA Subtitle C or similar regulation and that the

beneficial uses of FFC products identified in the Report to Congress are environmentally sound and do not constitute waste management. (USWAG00275)

As set forth in its initial comments, CIBO asserts that available scientific, analytic, demonstrative, and other data clearly sustain the conclusion that no aspect of the substances addressed in this RTC should be subjected to national Subtitle C regulation. The extension of federal Subtitle C authority over these uses would undermine the core objectives of RCRA. CIBO asserts that all available data demonstrates that all wastes and applications covered by the RTC should remain under the Bevill exemption. (CIBO00280)

Accordingly we call upon EPA to designate all fossil fuel wastes including those covered in the first Bevill Determination as hazardous waste in its Final Determination. (HEC00056)

The 49 undersigned local, regional, and national environmental and public health organizations urge the U.S. Environmental Protection Agency to reverse its pending decision to exempt fossil fuel combustion wastes from regulation under RCRA Subtitle C. (49CAO00058)

We request that US EPA regulate fossil fuel wastes including coal combustion wastes to be disposed in mines as a hazardous waste under RCRA subtitle C. We ask that at a minimum, the risk mitigation alternative outlined in the draft Determination be applied nationally to all disposal sites for CCW and other fossil fuel combustion wastes, wastes mixed with these wastes or wastes whose parent materials are combined with these wastes. We believe that the requirements for liners, leachate collection and ground water monitoring outlined under this alternative in the Determination are basic protections that must be afforded to the environment and/or citizens who live adjacent to or near sites where these wastes are disposed. (HEC00332)

#### **IV. MILL REJECTS (PYRITES)**

EPA tentatively concluded to retain the exemption for pyrite comanagement with coal combustion wastes (CCWs) in light of the development of a voluntary industry program of management controls. Comments were received on both sides of this issue. Several commenters, primarily from industry, expressed support for continuing to exclude pyrite comanagement disposal from Subtitle C regulation under the Bevill amendment, given the industry's voluntary program. Public interest group commenters argued that voluntary controls are inadequate and supported Subtitle C regulation. Specific concerns are summarized below.

Response: The Agency has determined that national regulation under Subtitle D authority is appropriate for coal combustion wastes managed in surface impoundments and landfills, as explained in Section I of this document. Therefore co-management with pyritic wastes will be covered by the regulations.

We remain encouraged by the utility industry program to educate its members and promote implementation of guidance on the proper management of coal mill rejects. However, as pointed out by commenters, there is no guarantee that facilities where coal combustion wastes are co-managed with pyritic wastes will adhere to the guidance developed by industry. At this time, to ensure that the Agency is aware of all stakeholders views on the adequacy of the control approaches described in the guidance to protect human health and the environment, we are soliciting public comment on the final version of the industry coal mill rejects guidance. This guidance is available in the docket supporting today's decision. We will take comments into account as we incorporate the guidance into national regulations as appropriate

EPA has considered the specific concerns raised by the commenters with regard to this decision. These are addressed in the sub-topic responses below.

#### **IV.MILL REJECTS ( PYRITES)**

##### **Verbatim Commenter Statements**

At USWAG's request, EPRI has prepared a comprehensive guidance document to assist the industry in understanding the nature of the problem and to provide the industry with a set of options for co-managing pyrites and coal combustion wastes to minimize pyrite oxidation. Once again, we are proud to report that USWAG members have 'stepped up to the plate' to address an environmental problem without the need for a regulatory prod. We are committed to continuing that educational effort. For that reason, we fully concur with EPA's recommendation that no additional regulations are necessary to address the potential consequences of pyrite oxidation when co-managed with coal combustion wastes. (USWAG00037)

TVA generally supports the conclusions of the RTC. We are fully supportive of the comments submitted by the Utility Solid Waste Activities Group (USWAG). (TVA00049)

I have reviewed EPA's March 1999 Report to Congress on Waste from the Combustion of Fossil Fuels. I am highly pleased that following 18 years of study pursuant to the 1980 Bevill Amendment to RCRA, EPA has finally concluded that electric utilities and independent power producers generally manage fossil fuel combustion wastes in an environmentally responsible manner and that the combustion wastes do not warrant hazardous waste regulation under RCRA. (BCHRL0002)

The Agency proposes to exempt pyritic wastes (coal mill rejects) from Subtitle C regulation...These decisions fail the Administrator's tests of consistency and reasonableness in decision-making...The Agency must not exempt pyritic wastes on these bases. (ALA00036)

We believe that the limited credible information in this Report as well as the extensive information demonstrating damages to the environment from these wastes unambiguously supports regulation of fossil fuel wastes as hazardous wastes under Subtitle C of RCRA. Accordingly we call upon EPA to designate all fossil fuel wastes including those covered in the first Bevill Determination as hazardous waste in its Final Determination. (HEC00056)

The 49 undersigned local, regional, and national environmental and public health organizations urge the U.S. Environmental Protection Agency to reverse its pending decision to exempt fossil fuel combustion wastes from regulation under RCRA Subtitle C. We are concerned that this decision, once again, would create a loophole to reduce the regulatory obligations for coal-fired power plants. (49CAO00058)

#### **IV. MILL REJECTS (PYRITES)**

##### **A. Voluntary Controls Not In Docket**

Several public interest groups commented that it would be very inappropriate to endorse a program the details of which were not included in the docket for public comment.

Response: At the time the Report to Congress was released, the voluntary industry guidance document was not finalized.. The final draft version of the industry guidance document, however, was included in the docket<sup>4</sup> when the RTC was published. The final, published version of the guidance is now available in the docket.<sup>5</sup> This final, published version is substantively the same as the version made available earlier for public comment.

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<sup>4</sup> FF2P-S0397. Guidance for Comanagement of Mill Rejects at Coal-fired Power Plants. EPRI. Draft. January 1999.

<sup>5</sup> FF2P-S0405. Guidance for Comanagement of Mill Rejects at Coal-fired Power Plants. EPRI. Final. June 1, 1999.

**IV. MILL REJECTS (PYRITES)**  
**A. Voluntary Controls Not In Docket**  
**Verbatim Commenter Statements**

It is completely inadequate for the Agency to rely on an industry proposal which is never elucidated (nor is it in the docket). (ALA00036)

Industry-EPA discussions about “voluntary control proposals” are not in the record, although the Agency relies on them in malting its draft Regulatory Determinations. The Agency does not present any information about what the voluntary industry proposals are. (ALA00036)

The Agency has referenced in several places its discussions with industry regarding "voluntary control proposals," or options, for managing the wastes short of Subtitle C regulatory requirements. However, it appears that those proposals have not been provided to the public to evaluate, although the Agency seems to be relying on them in lieu of Subtitle C rules. (49CAO00058)

#### **IV. MILL REJECTS (PYRITES)**

##### **B. Voluntary Program is No Substitute for a Regulation**

One public interest group commented that a voluntary program can not replace a regulation because adherence to the guidance is not guaranteed. The commenter suggested regulation is justified based on the characteristics of the waste and the damage case identified by the Agency. The commenter suggested a better approach would be to promulgate regulations and offer a delayed compliance schedule to facilities entering a voluntary early reduction program.

Response: The Agency has decided to develop national regulations for management of coal combustion wastes in landfills and surface impoundments. These regulations will cover co-managed pyritic wastes as well.



**IV. MILL REJECTS (PYRITES)**  
**B. Voluntary Program is No Substitute for Regulation**  
**Verbatim Commenter Statements**

The Agency proposes to exempt pyritic wastes (coal mill rejects) from Subtitle C regulation. This proposal is despite evidence presented by the Agency that shows acidic leachate from such material meets the RCRA characteristics test. In addition, the Agency presents proof of a damage case from pyritic waste disposal. The Agency is quick to point out, however that there are limited waste characterization data for pyritic waste and that the data could not be extrapolated to the industry as a whole (in other words, just because the samples that were gathered were toxic, doesn't mean all pyritic waste would be as toxic). This careful use of limited data is in direct contrast to the Agency's proposed actions to exempt co-burning wastes based on similarly limited data and, on no data at all as the basis for exempting beneficial uses. These decisions fail the Administrator's tests of consistency and reasonableness in decision-making. (ALA00036)

Instead of meeting its obligations under RCRA Subtitle C to regulate pyritic wastes, the Agency is "encouraged" by an industry proposal to control these wastes and offers to "follow-up on industry's progress" and "revisit if necessary". This decision has no basis in RCRA. The Report does not address whether there is adequate authority to control these wastes, nor is an economic analysis clone. It is completely inadequate for the Agency to rely on an industry proposal which is never elucidated (nor is it in the docket) and to offer a vague noncommittal oversight program which would be completely unenforceable. The Agency must not exempt pyritic wastes on these bases. (ALA00036)

In addition, the Agency provides no explanation as to why these voluntary proposals would be considered equivalent to federal or state regulatory authority. In the three-step decision making process described in the Report, the Agency states it will assess whether regulatory authority exists which would be adequate in the absence of a Subtitle C finding. A voluntary industry program is clearly not an adequate substitute for Federal or state regulatory authority. (ALA00036)

If all of the wastes are exempted from regulation (and the 44 states which follow the federal program also continue to exempt them). Where is the incentive for industry to enact voluntary controls? Why haven't they done it sooner if their intent was to change their practices? A better approach would be to promulgate regulations and offer a delayed compliance schedule to facilities entering a voluntary early reduction program. The Clean Air Act offers this precedence in section 112(e) of the 1990 amendments. (ALA00036)

**IV. MILL REJECTS (PYRITES)**  
**C. Definition of Pyrites**

An industry commenter requested that EPA clarify the meaning of pyrites as intended in the regulatory determination, stating that not all coal mill rejects are "pyritic." The commenter noted EPA has not defined a threshold concentration of pyritic material that would cause a mixture of large-volume FFC wastes and mill rejects to be considered pyrites subject to the guidance.

Response: The mill rejects (pyrites) guidance document provides information on how to determine, based on certain analytical tests, whether a particular pyritic waste and coal combustion waste mixture might create special management problems and thus be subject to the waste management techniques and practices recommended in the guidance. Hazardous waste regulations that the Agency will propose and promulgate will either contain or refer to a similar process for determining the need for special management of pyritic and coal combustion waste mixtures.

**IV. MILL REJECTS (PYRITES)**  
**C. Definition of Pyrites**  
**Verbatim Commenter Statements**

The Agency has identified several situations where “pyrite” materials described as sulfur-bearing components of mill rejects may be of some concern. We would urge the Agency to clearly define these “pyrite” materials. Typical coal mill systems reject many various materials as “pyrites” which will not meet grinding criteria, although very few of the materials rejected from low sulfur western coals are “pyritic.” It is unlikely that much material collected by the so-called “pyrite” systems in our coal mills are truly high sulfur bearing minerals. (NCE00031)

## V. WASTE FROM CO-BURNING

EPA included wastes from co-burning coal and other non-fossil fuels (provided that the coal component is at least 50 percent of the total fuel feed) in its tentative decision to continue the exemption from hazardous waste regulation for co-managed CCWs. Many commenters, primarily from industry, generally supported the tentative decision. Public interest group commenters, on the other hand, disagreed with the conclusion, stating that EPA's characterization of these wastes was wholly inadequate to come to any conclusion. One of these commenters expressed concern that coverage of co-burning would lead to the combustion of large volumes of hazardous waste in utility boilers, with the end result of power plants serving as *de facto* unregulated hazardous waste incinerators.

**Response:** The Agency has decided, in its regulatory determination, that co-burning wastes (i.e., combustion wastes from burning mixtures of coal and other non-fossil fuels) when disposed in landfills and surface impoundments should be regulated under Subtitle D authority. This is because the co-burning wastes contain levels of several hazardous metals that are similar or even higher than found in waste or leachate from combusting coal alone. Because of the presence of metals at those levels, the Agency believes these co-burning wastes have the potential to pose the same risks as coal combustion wastes which will be subject to national regulations, as explained in Section I of this document.

In the RTC, EPA identified 17 types of materials that had been reported by industry as sometimes being co-burned with coal. Characterization data (whole waste and TCLP test results for metals) were available for wastes from co-burning mixtures containing ten of these types of materials. For five of these ten materials, metals concentrations were within the ranges reported for utility wastes from coal combusted alone in the characterization data supporting the 1993 Regulatory Determination. The other five materials variously displayed maximum levels of several constituents (selenium, barium, chromium, copper, lead, zinc) in either whole waste or TCLP samples in excess of those reported for utility waste from coal combusted alone.

EPA acknowledged in the RTC the limitations of the available characterization data on wastes from co-burning coal and other non-fossil fuels. For example, a limited number of samples are available from any given fuel mixture and it is not possible to say with certainty whether the few elevated concentrations result from the coal or the other fuels in the mixture. However, the Agency properly concluded that many of the metals levels in wastes from co-burning coal and other non-fossil fuels are similar to wastes from coal burned alone. (Waste from fuel mixtures consisting of less than 50 percent coal are not, and never have been, covered under the Bevill exclusion. This 50 percent rule further limits the influence non-coal materials can have on the characteristics of the combustion waste. Typically, when coal is co-burned with other non-fossil fuels, the proportion of coal is 80 percent or higher.) No commenters provided any additional waste characterization data. The waste characterization data is available in the docket.

With regard to the comment about the co-burning of coal and hazardous waste, burners of coal and hazardous waste mixtures are subject to the Boiler and Industrial Furnace (BIF) rule under RCRA<sup>6</sup> and thus are not unregulated hazardous waste burners.

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<sup>6</sup>See 40 CFR 266.112.

## **V. WASTE FROM CO-BURNING**

### **Verbatim Commenter Statements**

ARIPPA supports the tentative conclusion of the U.S. Environmental Protection Agency (EPA) to retain the exemption for disposal of co-managed and co-burning coal combustion waste at utilities; coal combustion wastes at non-utilities; petroleum coke combustion waste; and for fluidized combustion waste. ARIPPA recommends that EPA continue to retain exemptions. (ARIPP00019)

PG&E Gen supports EPA's preliminary determination to retain the hazardous waste exemption for ... co-burning of coal with other fuels. (PG&E00023)

We respectfully ask that EPA not bow to pressure to extend the regulatory development timetable. It is time to put this issue to bed and allow us to move forward with the clean up of or scarred land. We also ask that the EPA base its decision on a fully informed process and sound science. In doing so, we are confident the Agency will see that there is no justification for expanding RCRA to include waste coal CFB, oil ash and mixtures of coal ash with other waste. (PAC00029).

Although EPA expressed some concern that the data were fairly limited,<sup>129</sup> EPA correctly concluded that the combustion residuals from co-burning fuel mixtures consisting primarily of coal do no warrant hazardous waste regulation. (USWAG00037)

Virginia Power fully supports the Agency's decision to exempt from RCRA Subtitle C requirements, co-managed wastes, which include petroleum coke combustion wastes, as well as mixtures of other fuels co-fired with coal. (VAP00042)

TVA generally supports the conclusions of the RTC. (TVA00049).

In its report, Environmental Protection Agency (EPA) made several tentative decisions to retain the exemption for the disposal of co-managed and co-burning coal combustion wastes at utilities, coal combustion wastes at non-utilities, petroleum coke combustion wastes; fluidized bed combustion wastes; and natural gas combustors. We agree and support these determinations. (CIBO00052)

The Maryland Coal Association appreciates the opportunity to make these comments on behalf of the existing exclusion of fossil fuel combustion by-products. (MDCAL0001)

I am highly pleased that following 18 years of study pursuant to the 1980 Bevill Amendment to RCRA, EPA has finally concluded that electric utilities and independent power producers generally manage fossil fuel combustion wastes in an environmentally responsible manner and that the combustion wastes do no warrant hazardous waste regulations under RCRA. (BCHRL002)

USWAG reiterates its recommendation that EPA issue a regulatory determination that all "remaining" FFC wastes do not warrant RCRA Subtitle C or similar regulation. (USWAG00275)

As set forth in its initial comments, CIBO asserts that available scientific, analytic, demonstrative, and other data clearly sustain the conclusion that no aspect of the substances addressed in the RTC

should be subjected to national Subtitle C regulation. CIBO asserts that all available data demonstrates that all wastes and applications covered by the RTC should remain under the Bevill exemption (CIBO00280)

I believe that we have amply and effectively demonstrated the successful balance between economic issues and the environmental concerns through adherence of the Pennsylvania regulations for CFB ash disposal and beneficial use and can see no benefit to the expansion of RCRA to include waste coal CFB ash and mixtures of coal ash with other fuel ash produced in a CFB. (GPC00297).

We believe that the limited credible information in this Report as well as the extensive information demonstrating damages to the environment from these wastes unambiguously supports regulation for fossil fuel wastes as hazardous wastes under Subtitle C or RCRA. Accordingly we call upon EPA to designate all fossil fuel wastes including those covered in the first Bevil Determination as hazardous waste in its Final Determination.. (HEC00056)

No attempt is made to estimate the volumes of such materials being co-burned or the resulting wastes or to even qualitatively state whether those volumes are large or small. There are a few sentences about the characterization of these wastes based on the data from a "small number of samples" for individual fuel mixtures collected by ERPI. Furthermore, EPA concedes the potential for elevated metals and organics in these wastes. Yet incredulously, there is no data in the report or referencing of any data in the Docket supporting any characterization of these wastes. (HEC00056)

EPA has not adequately characterized the waste, particularly wastes from co-burning coal with other potentially hazardous materials. It is unclear the extent to which EPA evaluated co-burning wastes. This is critical because EPA concludes that co-burning certain fuel mixtures may result in higher concentration in some metals although the limited sampling prevents any inference to be made but that no public health or environmental risks exist. (ALA00036)

The 49 undersigned local, regional, and national environmental and public health organizations urge the U.S. Environmental Protection Agency to reverse its pending decision to exempt fossil fuel combustion wastes from regulation under RCRA Subtitle C. (49CAO00058)

We request that US EPA regulate fossil fuel wastes including coal combustion wastes to be disposed in mines as hazardous waste under RCRA subtitle C. We ask that at a minimum, the risk mitigation alternative outlined in the draft Determination be applied nationally to all disposal sites for CCW and other fossil fuel combustion wastes, waste mixed with these wastes or wastes whose parent materials are co-burned with these wastes. We believe that the requirements for liners, leachate collection and ground water monitoring outlined under this alternative in the Determination are basic projections that must be afforded to the environment and/or citizens who live adjacent to or near sites where these wastes are disposed. (HEC00332)

The Agency has tentatively concluded that co-managed wastes, including wastes from other fuels co-fired with coal generally present a low inherent toxicity, are seldom characteristically hazardous, and generally do not present a risk to human health or the environment. With respect to co-burning other fuels, this conclusion has no basis and is clearly unfounded. (ALA0036)

The result of this exemption would be an increase in co-firing waste fuels with fossil fuels. Under the Clean Air Act, hazardous waste incinerators are subjected to emission limits for hazardous air pollutants (HAP). Because power plants are currently exempt from HAP regulations, the end results will be power plants serving as de facto unregulated hazardous waste incinerators. Waste from co-burning waste fuels should not be exempt from Subtitle C. (ALA0036)



## **VI. BENEFICIAL USE**

In the Report to Congress, EPA stated its tentative intention to grant permanent exemption from hazardous waste regulation for most beneficial uses of fossil fuel combustion (FFC) wastes (agricultural use is discussed in greater detail below). State, federal government, industry, and academic commenters expressed support for this conclusion given the absence of identifiable damage cases, fixation of waste in finished products, existing regulations, and/or low probability of adverse exposures. Several of these commenters pointed out EPA's opportunity (or responsibility) to promote beneficial use of FFC wastes beyond mere exemption. Public interest group commenters argued that retaining the exemption would be inappropriate because these beneficial uses were not adequately studied by EPA.

**Response:** The Agency is retaining the exemption for beneficial uses of coal combustion wastes other than minefilling. (We are also retaining the exemption for agricultural uses of coal combustion wastes, which is discussed separately in Section VIII.) We have reached this decision because: (a) we have not identified that any of the other beneficial uses are likely to present significant risks to human health or the environment; and (b) no documented cases of damage to human health or the environment have been identified. Additionally, we do not want to place any unnecessary barriers on the beneficial use of coal combustion wastes so that they can be used in applications that conserve natural resources and reduce disposal costs.

Disposal can be burdensome and fails to take advantage of beneficial characteristics of fossil fuel combustion wastes. About one-quarter of the coal combustion wastes now generated are diverted to beneficial uses. Currently, the major beneficial uses of coal combustion wastes include: construction (including building products, road base & sub-base, blasting grit and roofing materials) accounting for about 21%; sludge and waste stabilization and acid neutralization accounting for about 3%; and agricultural use accounting for 0.1%. Provided the practices do not pose risks, we support increases in the beneficial use of these wastes.

Off-site uses in construction, including wallboard, present low risk due to the coal combustion wastes being bound or encapsulated in the construction materials or because there is low potential for exposure. Use in waste and sludge stabilization and in acid neutralization are either regulated (under RCRA for hazardous waste stabilization or when placed in municipal solid waste landfills, or under the Clean Water Act in the case of municipal sewage sludge or wastewater neutralization), or appear to present low risk due to low exposure potential.

The Agency evaluated a number of case studies (available in the docket) of beneficial uses of coal combustion wastes, other than for agriculture. The Agency was not able to identify adverse effects associated with these types of beneficial uses, nor do we now believe that these uses of coal combustion wastes present a significant risk to human health or the environment. While some commenters disagreed with our findings, no data or other support for the commenters' position was provided, nor was any information provided to show risk or damage associated with agricultural use. Therefore, we conclude that none of these beneficial uses of coal combustion wastes pose risks of concern.

## **VI. BENEFICIAL USE**

### **Verbatim Commenter Statements**

IEU supports the EPA tentative conclusions that coal-fired utility co-managed wastes should remain exempt from RCRA Subtitle C regulation and that most, if not all, beneficial uses of these wastes should also remain exempt from Subtitle C regulation. (IEU00018)

EPA can give strong encouragement to these beneficial uses of CCPs, and carry out one of the principal objectives of RCRA: “promoting the demonstration, construction, and application of waste management, resource recovery, and resource conservation systems which preserve and enhance the quality of air, water, and land resources...” (NMA00024)

IMCC believes regulation under Subtitle C would promote a “one-size fits all” approach that will discourage recycling of coal ash and thereby encourage the placement of coal ash in less suitable or more expensive disposal environments. (IMCC00027)

Th[e] evidence clearly demonstrates that management of coal combustion wastes under the Resource Conservation and Recovery Act (RCRA) is unnecessary and counterproductive. (PCA00034)

Thunder Basin Coal encourages the EPA to not regulate these materials under RCRA, and adds that any federal regulations on CCW’s, such as those already imposed under TRI reporting would further inhibit the beneficial use of Coal Combustion Byproducts. (TBCC00035)

Virginia Power supports the Agency’s decision cited in the March 1999 “Report To Congress” to maintain the beneficial use exemption from RCRA Subtitle C for the use of co-managed wastes, including petroleum coke, and wastes generated from the combustion of other fuels with coal. (VAP00042)

Ash researchers at the EERC have long thought that reuse is nearly always a preferred option to disposal of CCBs which used beneficially are not FFC wastes but rather a valuable resource. (EERC00044)

First, I am pleased that the report does provide support for beneficial uses of coal combustion by-products (CCBs). (OSU00046)

It appears that current regulation of these activities is more than adequate. Subtitle D regulatory authority should remain adequate for governing the management and beneficial use of CCPs in the future. (ISG00048)

In short, TVA believes that beneficial reuse of CCPs preserves natural resources and can be used in an environmentally responsible manner. (TVA00049)

TXU supports the general conclusion reached by EPA in the RTC that disposal of co-managed wastes generated at coal-fired utilities, including beneficial utilization, should remain exempt from

the provisions of subtitle C of the Resource Conservation and Recovery Act (RCRA). (TXU00053)

We also concur with the EPA's recommendation that most beneficial uses of these wastes should also remain exempt from Subtitle C in light of the absence of identifiable damage cases, fixation of waste in finished products, and/or low probability of adverse exposures. (TXU00053)

TXU concurs with EPA's tentative conclusion that non-utility coal combustion wastes and beneficial uses of such wastes should remain exempt from RCRA Subtitle C. (TXU00053)

AEP would further assert that beneficial uses of co-managed CCPs should also remain exempt from Subtitle C regulation, and even encouraged by EPA. (AEP00060)

I am highly pleased that following 18 years of study pursuant to the 1980 Beville Amendment to RCRA, EPA has finally concluded that electric utilities and independent power producers generally manage fossil fuel combustion wastes in an environmentally responsible manner and that the combustion wastes do not warrant hazardous waste regulations under RCRA. (BCHRL0002)

The agency's tentative conclusion not to impose Subtitle C rules on the use and disposal of such CCPs is well-founded. (WVDEPL0003)

USWAG reiterates its recommendation that EPA issue a regulatory determination that all "remaining" FFC wastes do not warrant RCRA Subtitle C or similar regulation and that the beneficial uses of FFC products identified in the Report to Congress are environmentally sound and do not constitute waste management. (USWAG00275)

EPA can remove barriers and encourage the use of coal fly ash to the maximum extent possible with its regulatory determination following its RTC on fossil fuel combustion. (ACAA00276)

USWAG concurs with EPA's recommendation that beneficial uses of OCWs remain excluded from Subtitle C. The record fully supports EPA's conclusion that "[n]o significant risks to human health exist for the identified beneficial uses of these wastes."<sup>162</sup> (USWAG00037)

The Agency should not issue a blanket exemption for other beneficial uses of FFC waste because none of the other beneficial uses were considered in the risk assessment. Therefore, the Agency has no basis for granting this exemption. (ALA00036)

We believe that the limited credible information in this Report as well as the extensive information demonstrating damages to the environment from these wastes unambiguously supports regulation for fossil fuel wastes as hazardous wastes under Subtitle C or RCRA. Accordingly we call upon EPA to designate all fossil fuel wastes including those covered in the first Beville Determination as hazardous waste in its Final Determination.. (HEC00056)

Several commenters requested that EPA promote increased beneficial use of FFC wastes by excluding, or encouraging states to exclude, FFC wastes from the definition of solid wastes when beneficially used. In support of this, one of the commenters stated that beneficial use

declined by 25 percent as a result of Indiana's inclusion of these materials within its definition of waste.

Response: The Agency will not exclude FFC wastes from the definition of solid waste when beneficially used. Some states that are generally supportive of beneficial uses exercise oversight and controls over the beneficial uses under their authority to regulate waste management. If EPA were to exclude these uses from the definition of solid waste, it could undermine state programs, which we believe are important to ensure that beneficial uses are protective of human health and the environment.

In addition, the RTC did not discuss exempting FFC wastes from the definition of solid waste when beneficially used. Before the Agency could consider any such action, we would have to go through a full notice and comment period to allow all interested parties full opportunity to provide input.

Do perceptions make a difference? YES. The beneficial reuse of CCP (excluding mine placement for reclamation) declined by 25% as a result of Indiana's characterization of fossil fuel combustion products as coal combustion waste. (IEU00018)

EPA can [encourage beneficial use] by ... recognizing that CCPs, when beneficially used in accordance with state statutory and regulatory requirements and procedures, are not wastes. Placement of CCPs on the ground as part of their beneficial use does not constitute "disposal" of a waste under RCRA. Rather, when beneficially used, CCPs are materials with a clear environmental and commercial value. In the case of CCPs, removing these regulatory barriers will have only positive environmental and economic results. (NMA00024)

Regulations send messages to people interested in use of coal combustion products. The words waste and RCRA scare customers away. EPA has an opportunity in it's coming decision to tell people there will be no Federal RCRA regulations of these materials and to clear the way for states to develop regulatory programs that eliminate the word "waste" following recycled materials even after they are put to reuse. (NMA00024A)

First, to help level the competitive playing field for CCPs and competing virgin material products, EPA should strongly urge all Federal and State agencies to refrain from applying waste regulations to CCPs when used in a recognized on-site application as a substitute for other competing products. (USWAG00037)

I am also pleased to observe in the Report that EPA has determined that the recycling of these combustion residuals into useful commercial applications is environmentally safe. I would urge you to take this "clean bill of health" for coal ash utilization and actively promote increased utilization of this product by, among other things, encouraging State and Federal regulatory programs to avoid applying "waste" regulations to coal ash when it is beneficially used in a product. In my opinion, coal combustion products should be subject to the same regulatory requirements applicable to competing products using virgin materials. (BCHRL0002)

USWAG reiterates its recommendation that EPA issue a regulatory determination that all "remaining" FFC wastes do not warrant RCRA Subtitle C or similar regulation and that the

beneficial uses of FFC products identified in the Report to Congress are environmentally sound and do not constitute waste management. (USWAG00275)

## **VI. BENEFICIAL USE**

### **B. General Promotion of Beneficial Use**

Some of the industry and academic commenters suggested EPA take specific steps to promote beneficial use. These commenters stated that the broad requirements of RCRA include promotion of resource conservation, and that promotion of beneficial uses of FFC wastes is most consistent with RCRA and the responsibility of EPA. One of the commenters suggested specifically adding all of the identified beneficial uses to the annual EPA Comprehensive Procurement Guidelines. One public interest group commenter suggested that more stringent regulation of disposal would help promote alternative beneficial uses.

Response: The Agency agrees that beneficial uses of fossil fuel combustion waste that are environmentally protective are desirable and believes that the decision to retain the Bevill exemption for these wastes is an incentive both for generators and potential users to pursue more extensive beneficial uses. As documented by the industry in data provided to support the Report to Congress and Regulatory Determination, companies are extensively pursuing beneficial uses when they are economically feasible. In addition, the Agency recently promulgated a Comprehensive Procurement Guideline (CPG) for Flowable Fill Containing Coal Fly Ash and/or Ferrous Foundry Sands (65FR 3070, January 19, 2000; 40 CFR 247.12 (i)) to encourage beneficial use of coal fly ash. The Agency does not agree that more stringent regulation of disposal practices will promote alternative beneficial uses. Current beneficial uses are usually limited, in part, by transportation costs, to uses in relative proximity to the facilities where they are generated.

**VI. BENEFICIAL USE**  
**B. General Promotion of Beneficial Use**  
**Verbatim Commenter Statements**

Responsible beneficial use of CCP should be advocated by EPA and the regulatory determination should not place additional barriers, institutional or regulatory, or existing or future practices. (IEU00018)

EPA can give strong encouragement to these beneficial uses of CCPs, and carry out one of the principal objectives of RCRA: “promoting the demonstration, construction, and application of waste management, resource recovery, and resource conservation systems which preserve and enhance the quality of air, water, and land resources...” RCRA Section 1003(10). (NMA00024)

Given EPA’s positive findings on the environmental performance of such use, EPA should “step up to plate” and join in a meaningful way with the industry and many states to encourage increased diversion of these materials from waste management to product use. (USWAG00037)

First, to help level the competitive playing field for CCPs and competing virgin material products, EPA should strongly urge all Federal and State agencies to refrain from applying waste regulations to CCPs when used in a recognized on-site application as a substitute for other competing products. Second, EPA should commit to adding to the annual EPA Comprehensive Procurement Guidelines all of the beneficial uses identified in the RTC that are likely to meet the procurement needs of Federal or State procurement agencies. (USWAG00037)

EPA is presented with an opportunity to continue to expand its role in the promotion of increased use of CCBs by continuing to actively promote ash used under the policy of procurement of environmentally preferable products. It is our belief at CARRC that EPA is in a key position to promote and increase the safe and environmentally responsible utilization and recycling of CCBs as a preferred option to disposal as wastes. (EERC00044)

First, I am pleased that the report does provide support for beneficial uses of coal combustion by-products (CCBs). This must be continued and strongly encouraged in the future. (OSU00046)

AEP would further assert that beneficial uses of co-managed CCPs should also remain exempt from Subtitle C regulation, and even encouraged by EPA. (AEP00060)

EPA can remove barriers and encourage the use of coal fly ash to the maximum extent possible with its regulatory determination following the RTC on fossil fuel (ACAA00276)

The Report is completely oblivious to the possibility that many beneficial uses of fossil fuel wastes are an alternative to current disposal methods and that the level of such uses might be closely related to the stringency of disposal requirements. Greater efforts to invest in research and development of safe beneficial uses would likely be encouraged by requirements that prohibit the open dumping of these wastes and effectively hold waste generators liable for the contamination created by their disposal practices. Indeed in Indiana, where regulators have developed ash reuse policies with environmental safeguards that are deliberately more streamlined than such

requirements in their disposal rules to encourage reuse instead of disposal. This Determination must examine the relationship between disposal and reuse. (HEC00056)



## **VI. BENEFICIAL USE**

### **C. Adequacy of EPA's Study of Beneficial Use**

Public interest groups commented that the Agency has not adequately analyzed the so-called beneficial uses and, therefore, it would be inappropriate to exempt beneficial uses at this time. One group expressed particular concern with cross-media releases of mercury from these uses. Another group commented that the Agency had not appropriately considered the costs of regulating such uses. An industry commenter stated that, to the best of its knowledge and contrary to statements in the Report, no oil combustion wastes have been used for structural fill or construction applications.

Response: EPA believes that it has adequately studied the beneficial uses of FFC wastes. The Agency conducted an extensive review of industry and academic literature describing these uses and analyzing their benefits, economic potential, and environmental impact. The results of this review are presented in the rulemaking docket.<sup>7</sup> This study supports the conclusion that there are real benefits to beneficial uses of FFC wastes and potential markets for many of these uses. One industry commenter (ACAA00276) provided additional documentation regarding the benefits of several of these uses.

Included in the Agency's review were a number of studies considering the environmental impacts of a variety of specific beneficial uses. EPA notes that most of these studies did not conclude that there was a significant risk to human health or the environment from the beneficial uses studied. The paragraphs below describe each of the beneficial use categories identified in EPA's review.

In the Technical Background Document on Beneficial Use of Fossil Fuel Combustion Wastes,<sup>8</sup> the Agency identified the following categories of beneficial use:

- agricultural uses,
- mining applications,
- use in cement and concrete products,
- use in other products (wallboard, mineral fill, etc.),
- construction fills,
- waste management, and
- use as blasting grit or in snow and ice control.

In its risk assessment, EPA specifically modeled the potential risks associated with agricultural use. The Agency's conclusions with regard to this category of use are discussed under Topic VIII. For the other categories of beneficial use, EPA believes that the scenarios modeled in its risk assessment adequately bound, and likely overestimate, the potential risks as discussed below.

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<sup>7</sup> FF2P-S0265. Technical Background Document: Beneficial Use of Fossil Fuel Combustion Wastes. EPA. October, 1998.

<sup>8</sup> FF2P-S0265.

When used in cement and concrete products, FFC wastes are encapsulated in the cement matrix. Similarly, when used in other products, such as wallboard, plastics, ceramics, and mineral wool insulation, FFC wastes are encapsulated within the product and exposure of the final product to the environment is limited. Leaching and other test results reported in the literature support this conclusion (EPRI, 1985, Coal-Waste Artificial Reef Program, EPRI Report No. CS-3936, Docket # FF2P-S0204; and EPRI, 1996, Environmental and Physical Properties of Autoclaved Cellular Concrete, Volumes 1-3, EPRI Report No. TR-105821, Docket # FF2P-S0219). Furthermore, the quantities of FFC wastes used in these applications at a given site are much less than those managed in a typical disposal unit. Therefore, once FFC wastes are incorporated in these products, potential risks to human health and the environment are less than those from unlined disposal units.

Construction fill uses of FFC wastes include backfills, embankments, area fills, grouts, and road base and road subbase applications. Some, but not all, of these uses involve incorporation of the FFC wastes into a cementitious matrix, mitigating potential risks as discussed for cement and concrete products. Some of these uses also involve the use of cover materials that can limit mobilization of FFC waste constituents. For example, in road base construction, FFC wastes are covered by an upper layer of asphalt. Some other construction fills employ a cover layer of soil. Even for non-cementitious, uncovered construction fills, however, the potential for mobilization of constituents of concern is likely to be no greater than that for disposal units. Given that construction fills are smaller in size than typical disposal units and typically combine FFC wastes with other materials, the potential for leaching to ground water, erosion to surface water, or airborne transport from construction fills is expected to be less than that from disposal units. It is possible that direct human exposures to FFC wastes in some construction fills where the site is uncontrolled could be greater than for disposal units. Direct plant uptake also might be greater where plant growth is encouraged on the construction fill. Potential risks from these two pathways, however, are expected to be similar to, but no greater than, those modeled for agricultural soil amendment. Therefore, the scenarios modeled for the risk assessment adequately bound the potential risks from even uncovered, non-cementitious construction fills.

Waste management uses of FFC wastes include use in waste stabilization/solidification and use in landfill construction as liner or cover material. In waste stabilization or solidification, the FFC wastes become part of a cementitious matrix, as discussed for cement and concrete products. The stabilized or solidified wastes also typically are disposed in a Subtitle C landfill, further mitigating potential risks.

Uses of FFC waste as blasting grit and for snow and ice control are similar to agricultural application, in that these uses may result in spreading FFC waste over an area. In blasting grit and snow and ice control uses, however, the area to which FFC waste is applied is likely to be smaller than a typical agricultural field. The quantity of waste used per application and the frequency of application also are likely to be less. Also, because these uses do not involve direct application to areas growing crops, the potential for direct plant uptake may be somewhat reduced. Thus, the agricultural soil application scenario modeled for the risk assessment can be expected to reasonably bound potential risk from these uses.

With regard to the comment about economic impacts of regulating beneficial use, EPA did not explicitly study such impacts because no risks were identified to warrant such regulation.

With regard to the comment that beneficial uses could increase substantially if disposal requirements are tightened, the Agency believes that there must be a risk basis for imposing more stringent disposal requirements. Increasing beneficial use of material is not a sufficient reason to impose more stringent requirements, in the absence of a showing of risk.

With regard to the comment about use of oil combustion wastes in construction applications, the information in the Report to Congress was derived from an EPRI report on oil combustion waste management.<sup>9</sup> This report identified use in concrete products as a waste management practice when economically viable at several facilities and explicitly stated that “construction uses include concrete products, structural fill and roadbed fill. Currently, only minor amounts of oil ash are used in construction application, although one utility is preparing to pursue this option more vigorously in the near future.”

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<sup>9</sup> FF2P-S0326. Oil Combustion By-Products: Chemical Characteristics, Management Practices, and Groundwater Effects. EPRI. March 1, 1998.

**VI. BENEFICIAL USE**  
**C. Adequacy of EPA's Study of Beneficial Use**  
**Verbatim Commenter Statements**

Except for agricultural applications, the "beneficial uses" of these wastes are not considered at all. These uses should be considered particularly from the standpoint of cross-media releases of mercury. For example, FBC sludge use for cement manufacturing will certainly release mercury to the environment. (ALA00036)

The Agency should not issue a blanket exemption for other beneficial uses of FFC waste because none of the other beneficial uses were considered in the risk assessment. Therefore, the Agency has no basis for granting this exemption. (ALA00036)

The Report discusses beneficial uses of fossil fuel wastes and includes some estimates of the volume of wastes consumed for "beneficial use," for example see Table 3-16 outlining such volumes for uses of utility CCW in 1997. However, the Report contains no credible discussion of the potential utilization of fossil fuel wastes. As previously pointed out, the possibility that the utilization of these wastes for certain beneficial purposes could increase, even skyrocket, if disposal requirements are tightened is not discussed. (HEC00056)

There are also no estimates of the costs of beneficial uses of these wastes in the Report. (HEC00056)

There is an inaccurate statement on oil ash use: to the best of PG&E Gen's knowledge, no oil combustion waste have been used for structural fill or construction applications. (PG&E00023)

## **VII. MINEFILL**

In the Report to Congress, EPA requested further information on minefill practices and impacts to provide a better basis for evaluating the appropriateness of more stringent regulation of the range of such practices. Several commenters from industry and a federal agency supported the Agency's decision to study the issue further and not attempt to model minefill risks using existing methodologies. These and many other commenters responded to the Agency's request for further information by providing detailed case studies, descriptions of state regulations, and other data.

Many industry, academic, and state and federal government commenters encouraged EPA not to adopt federal regulations and/or voluntary restrictions on minefilling for a variety of reasons, as further discussed below. Some commenters recommended EPA take steps to encourage minefilling.

A public interest group commenter encouraged EPA to take steps to regulate or prohibit minefilling because of weaknesses in state regulatory programs, environmental performance of existing minefills, and environmental justice issues, as also discussed below. This commenter expressed concern that EPA did not attempt to calculate the risk associated with minefilling. A number of other public interest group, academic, and citizen commenters also requested that EPA regulate minefilling under Subtitle C or other statutory authority, or ban the practice altogether.

Other public interest commenters expressed concern that lack of regulation on minefilling would result in an increasing trend toward use of this practice, particularly given deregulation of electricity generators. Another public interest group commenter stated that EPA should undertake a systematic study evaluating minefilling, and, in the absence of this study, should not allow minefilling. This commenter further stated that federal regulation would be desirable to provide a common framework for analysis of minefilling projects.

In sum, many comments were received on both sides of this issue as to whether or not minefilling as practiced on a nationwide basis is protective of human health and the environment.

Response: Commenters provided very extensive information on minefilling. EPA completed an analysis of this information, along with a review of the information previously collected in support of the Report to Congress. We determined that it is appropriate to establish national regulations under RCRA Subtitle D applicable to the placement of coal combustion wastes in surface or underground mines. We have determined that the establishment of national regulations is warranted for coal combustion wastes when they are placed in surface or underground mines because: (a) we find that these wastes when minefilled have the potential to present a danger to human health and the environment, (b) minefilling of these wastes has been an expanding practice and there are few states that currently operate comprehensive programs that specifically address the unique circumstances of minefilling, making it more likely that any damage to human health or the environment would go unnoticed or unaddressed, and (c) we believe that the cost of complying with regulations that address these potential dangers may not have a substantial impact on this practice because minefilling continues to grow in those few states that already have comprehensive programs.

We recognize that at this time, we cannot quantify the nature of damage that may be occurring or may occur in the future as a result of using coal combustion wastes as minefill. It is often impossible to determine if existing groundwater quality has been impacted by previous mining operations or as a result of releases of hazardous constituents from the coal combustion wastes used in minefilling applications. We have not as yet identified proven damage cases resulting from the use of coal combustion wastes for minefilling.

We also acknowledge that when the complexities related to site-specific geology, hydrology, waste chemistry and interactions with the surrounding matrix, and other relevant factors are properly taken into account, coal combustion wastes used as minefill can provide significant benefits. However, when not done properly, minefilling has the potential to contaminate ground water to levels that could damage human health and the environment. Based on materials submitted during the public comment period, coal combustion wastes used as minefill can lead to increases in hazardous metals released into ground water if the acidity within the mine overwhelms the capacity of the coal combustion wastes to neutralize the acidic conditions. This is due to the increased leaching of hazardous metals from the wastes. The potential for this to occur is further supported by data showing that management of coal combustion wastes in the presence of acid-generating pyritic wastes has caused metals to leach from the combustion wastes at much higher levels than are predicted by leach test data for coal combustion wastes when strongly acidic conditions are not present. Such strongly acidic conditions often exist at mining sites.

Although we have identified no damage cases involving minefilling, we are also aware of situations where coal combustion wastes are being placed in direct contact with ground water in both surface and underground mines. We concluded in our recent study of cement kiln dust management practices that placement of cement kiln dust in direct contact with ground water led to a substantially greater release of hazardous metals than we predicted would occur when the waste was placed above the water table. For this reason, we find that there is a potential for increased releases of hazardous metals as a result of placing coal combustion wastes in direct contact with groundwater. Also, there are damage cases associated with coal combustion wastes in landfills. The Agency believes it is reasonable to be concerned when similar quantities of coal combustion wastes are placed in mines, which often are not engineered disposal units and in some cases involve direct placement of wastes into direct contact with ground water.

We are concerned that government oversight is necessary to ensure that minefilling is done appropriately to protect human health and the environment, particularly since minefilling is a recent, but rapidly expanding use of coal combustion wastes. Government oversight has not yet “caught up” with the practice consistently across the country. There are some states that have programs that specifically address minefilling practices. We are likely to find that their programs or certain elements of their programs could serve as the basis for a comprehensive, flexible set of national management standards that ensure protection of human health and the environment. We also believe that these state programs will provide valuable experience in coordinating with SMCRA program requirements. However, at this time, few of the programs are comprehensive. Commenters pointed out, and we agree, there are significant gaps in other states. We believe that additional requirements for long-term groundwater monitoring, and controls on wastes placed directly into groundwater might be prudent.

EPA has considered the specific concerns raised by the commenters with regard to this decision. These are addressed in the sub-topic responses below.

## **VII. MINEFILL**

### **Verbatim Commenter Statements**

In practice, however, the number of required model inputs (whether hydrologic or geochemical) and the uncertainty associated with the values of these inputs will limit the ability for a model or combination of models to yield predictions that would be of practical value. (DOE00020)

The RTC noted that EPA encountered difficulty distinguishing the effects of mine placement activities from pre-existing environmental concerns, such as acid mine drainage (“AMD”), in the limited time remaining in the study period after identification of potential environmental issues related to mine placement. USWAG commends EPA for recognizing its limitations and not rushing to an uninformed conclusion. (USWAG00037)

USWAG commends EPA for its decision to distance itself from modeling where, as in this case, use of that tool is unlikely to produce reliable results. (USWAG00037)

An analysis of CCP placement in mines is not amenable to generic modeling of the sort EPA employed to analyze the placement of CCPs in landfills and surface impoundments. (USWAG00037)

The agency acknowledged that it did not have the technical data or modeling capabilities to reach a conclusion on this issue. USWAG commended the EPA for acknowledging its limitation and deferring the decision. (APSC00043)

The Bureau suggests that further consideration of existing information gathered during this current review be compiled into an accessible database for consideration by carefully selected experts and potential users before any decision is made. (MDE00047)

However, OCDO is concerned that the report suggests a possible need for federal regulation under Subtitle C for agricultural and minefill applications, and strongly recommends this not be implemented for the following reasons. (ODOD00017)

Subtitle C regulation would not effectively address the issues associated with CCP placement in mines at reasonable costs. (IEU00018)

ARIPPA does not support EPA’s tentative conclusions concerning the beneficial use of coal combustion wastes. Further, ARIPPA can not support a recommendation by EPA to either establish regulations under Subtitle C or RCRA or to establish a voluntary program for control of the use of ash as a mine fill as part of active or abandoned mine reclamation. (ARIPPA00019)

DOE believes that EPA should not subject the minefilling of coal-fired utility co-managed wastes (Volume 1, Section 3, page 3-7) or fluidized bed combustion wastes (Volume 1, Section 5, page 5-4) to any form of control under RCRA Subtitle C. (DOE00020)

These results support a policy of not subjecting CCW to Subtitle C regulation in surface mine backfilling applications. (DOE00020)





**VII. MINEFILL**  
**Verbatim Commenter Statements** (continued)

The experimental nature of this practice and the lack of environmental damage related to the beneficial use of these CCW support a view that EPA should not subject CCW to Subtitle C regulation in underground mine backfilling applications. (DOE00020)

DOE believes that these studies demonstrate that these beneficial uses and disposal of CCW should remain exempt from RCRA Subtitle C regulation. (DOE00020)

The states have demonstrated not only that agricultural and mining applications of CCPs are satisfactorily regulated at the state level, but also that further regulation of the federal level is not needed. (ACAA00022)

PG&E Gen believes it would be arbitrary and unwarranted to restrict the use of FBC ash in minefilling. (PG&E00023)

For the reasons set forth in detail below, NMA opposes the suggestion by EPA that any form of RCRA Subtitle C regulation is appropriate for the use or disposal of CCPs for agricultural purposes or for minefill. NMA urges that in the Regulatory Determination, EPA decide that the beneficial use and disposal of CCPs for agricultural purposes and for minefill should continue to be exempt from RCRA regulation. (NMA00024)

I am writing to express my concern over the Environmental Protection Agency's incongruous conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. For example, EPA determined that waste coal ash itself is exempt from regulation, yet it also determined that its beneficial use in mine reclamation or agricultural amendments should be regulated and managed as hazardous waste. (PAC00029)

To attempt to regulate a national directive on minefill would negate those positive applications that have already been demonstrated successfully. (NCE00031)

EPA regulatory guidance may not be flexible enough to permit state and local agencies to approve these applications when site-specific situations pose little or no threat to public health or the environment. (NCE00031)

It is scientifically inappropriate to apply blanket restrictions to a material that can be beneficially used in a vast number of applications based on the above mentioned variability's. Historically successful applications of CCBs in mining and agricultural applications demonstrate that CCBs can be used beneficially and certainly with no negative environmental impact. Therefore, we see no need for federal regulation under Subtitle C and believe the proper management of CCBs is a sound environmental practice. (NCE00031)

This evidence clearly demonstrates that management of coal combustion wastes under the Resource Conservation and Recovery Act (RCRA) is unnecessary and counterproductive. As DEP's collected data clearly illustrate, ash has been used in a variety of contexts -- including

minefilling, agricultural soil supplementation and beneficial use -- without degradation of groundwater. In fact, the use of ash resulted in significant water quality improvements in many cases. (PCA00034)

The risks associated with the use of coal ash as minefill are extremely low and are certainly insufficient to warrant inclusion of these materials in subtitle C of RCRA.(PCA00034)

**VII. MINEFILL**  
**Verbatim Commenter Statements** (continued)

Thunder Basin Coal encourages the EPA to not regulate these materials under RCRA, and adds that any federal regulations on CCB's, such as those already imposed under TRI reporting would further inhibit the beneficial use of Coal Combustion Byproducts. (TBCC00035)

Indeed, if EPA reviews the information gathered by these other agencies and private entities, it will become evident that the only appropriate action is further reduction of regulatory barriers to the beneficial use of CCPs to remedy environmental problems in post-mining environments. (USWAG00037)

USWAG urges EPA to recognize mine placement as beneficial uses where the CCPs are utilized with no significant environmental degradation as substitutes for other commercially available materials or where the economics of CCP placement enables mine reclamation related activities or prevention or mitigation of mining-related environmental damage that otherwise not be feasible. (USWAG00037)

We agree and would like to endorse these comments by ACAA and The Ohio Coal Development Office that specifically address their concern for not interfering with or complicating beneficial uses in agriculture and minefill applications. (DTC00038)

I have a concern with the tentative recommendation in the EPA report that agricultural and mine reclamation use of FFCWs be limited to those materials with As concentrations no higher than that found in agricultural lime. Such a restriction would severely limit, if not eliminate, any beneficial use of these materials as soil amendments. A much higher As concentration limit could be used without any real increase in risk. (PSU00040)

However, Virginia Power does not support the Agency's need to possibly subject the minefill operations and agricultural beneficial use applications to RCRA Subtitle C requirements. (VAP00042)

Therefore the management of these by-products under RCRA Subtitle C would reverse the environmental progress gained since the 1993 EPA regulatory determination. This reversal would create a major setback for the Mettiki site, the Illinois site, and the Winding Ridge site, not to mention other successful minefill sites across the country. (VAP00042)

The EERC's experience (Beaver and others; 1987; Butler and others; 1995) supports the position that a complete understanding of the CCBs and the placement settings provides state and regional agencies with information on which sound decisions on mine placement of CCBs can be made. (EERC00044)

States have the ability to develop effective landfill, mine reclamation, and agricultural programs. These programs are developed within each state and can best reflect their unique environmental factors, social and economic needs. It appears that current regulation of these activities is more

than adequate. Consequently, existing RCRA Subtitle D regulatory authority should remain adequate for governing the management and beneficial use of CCPs in the future. (ISG00048)

We believe there is abundant data that supports a technical foundation for pursuing commercial uses of CCPs in agriculture and in mine reclamation without compromising the health or safety of the public or environment. (TVA00049)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize the comprehensive restoration effort throughout the coal-bearing regions of Pennsylvania. (STR00050)

CIBO disagrees with any suggestion in the RTC that some regulation under Subtitle C may be necessary for mine reclamations/minefill applications, use of fossil fuel combustion ash for agricultural purposes, and oil ash disposal. CIBO submits that data -- and sound RCRA policy -- support the conclusion that no aspect of these substances warrants subjecting them to national Subtitle C regulation in any form. (CIBO00052)

TXU supports the general conclusion reached by EPA in the RTC that disposal of co-managed wastes generated at coal-fired utilities, including beneficial utilization, should remain exempt from the provisions of subtitle C of the Resource Conservation and Recovery Act (RCRA). (TXU00053)

TXU concurs with EPA's tentative conclusion that non-utility coal combustion wastes and beneficial uses of such wastes should remain exempt from RCRA Subtitle C. We believe that this finding is supported by the data developed concerning waste management practices, potential risks, and existing regulatory controls. (TXU00053)

AEP would further assert that beneficial uses of comanaged CCPs should also remain exempt from Subtitle C regulation, and even encouraged by EPA. (AEP00060)

The case study information clearly supports our industry held view that CCPs can be utilized in environmentally responsible beneficial end use applications within mine settings. (AEP00060)

It is examples such as these that lead us to encourage the USEPA to continue to exempt coal ash placement in coal mine environments from the requirements of Subtitle C. (IDNR00062)

DEP joins in the detailed comments filed by the National Mining Association to this rulemaking which opposes the suggestion by EPA that any form of RCRA Subtitle C regulation is appropriate for the use or disposal of CCPs for agricultural purposes or for minefill. DEP urges that in the Regulatory Determination, EPA decide that the beneficial use and disposal of CCPs for agricultural purposes and for minefill should continue to be exempt from RCRA regulation. (WVDEPL0003)

The ACAA and PP&L believe the beneficial use of coal ash as minefill is being effectively managed in Pennsylvania under existing regulatory mechanisms and that Federal controls are unnecessary and may even thwart these beneficial initiatives. (PHS013)

The ACAA and PP&L believe that minefill should be left to the states to regulate, based on state-specific needs and priorities. (PHS013)

I urge EPA to consider these factors. In doing so, I am confident the Agency will conclude that there is no justification for regulating the beneficial use of approved coal ash and waste coal ash in mine reclamation and agricultural projects as hazardous waste. (PADEP00246)

It has come to my attention that the Environmental Protection Agency (EPA) is contemplating a regulatory change which would require coal ash used in mine reclamation to be managed as a hazardous waste under the RCRA Subtitle C program. I write today to convey my concerns regarding this potential regulatory determination and to urge EPA to carefully consider the effects of such an action on Pennsylvania's abandoned mine reclamation and acid mine drainage abatement efforts. (PA00247)

Requiring waste coal ash used as minefill to be handled as hazardous waste will deter its beneficial application in mine reclamation and discourage the cleanup of unsightly and dangerous waste coal piles. Moreover, such an action appears inconsistent with the agency's general conclusion that the material itself is exempt from regulation under RCRA. EPA has done much in recent years to eliminate conflictive and inconsistent regulations which reduced program effectiveness and impeded environmental improvements. The agency also has voiced its willingness to let states manage environmental programs where such management is both protective and effective. I submit that action by EPA to apply RCRA regulation to the beneficial use of waste coal ash in mine reclamation would directly contravene these policy objectives. (PA00247)

I am writing on behalf of the Eastern PA Coalition for Abandoned Mine Reclamation (EPCAMR) to express our concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants... Specifically in the report, the EPA determined that waste coal ash itself is exempt from regulation, yet surprisingly the Agency determined that the beneficial use of coal ash in mine reclamation and agricultural amendments should be regulated as hazardous waste. (EPACAMR00248)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (PCLP00249)

I write to express my concern about the Environmental Protection Agency's conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants ... A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous could jeopardize these operations. (PAEC00251)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt

from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (G&L00252)

I write to express my concern about the Environmental Protection Agency's conclusions contained in its second Report to Congress Wastes from the Combustion of Fossil Fuels. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (PA00253)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (CIN00254)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (EPC00255)

The ICC believes a prohibition on coal ash disposal below the water table, which would in fact ban such disposal in Indiana, is unwarranted and that EPA's concern for such is unfounded. (ICC00269)

We urge the Agency not to expand RCRA to include regulating the beneficial use of non-hazardous CFB ash in agriculture or mine reclamation. (AIRP00270)

ARIPPA submitted comments in this proceeding on June 12, 1999. Those comments opposed any recommendation by the U. S. Environmental Protection Agency ("EPA") to regulate the use of ash from circulating fluidized bed ("CFB") boilers for mine reclamation as a hazardous waste under Subtitle C of the Resource Conservation and Recovery ACT ("RCRA"). ARIPPA's specific concern is ash from coal refuse, which was included as part of the fluidized bed combustion ("FBC") ash addressed by EPA's March 1999 Report to Congress on Wastes from the Combustion of Fossil Fuel ("Report to Congress"). ARIPPA hereby reiterates its opposition to any such recommendation. (ARIPPA00273)

PG&E Gen urges EPA to continue the current RCRA exemption of coal ash in beneficial uses for soil amendments and mine reclamation. (PG&E00274)

USWAG reiterates its recommendation that EPA issue a regulatory determination that all "remaining" FFC wastes do not warrant RCRA Subtitle C or similar regulation and that the beneficial uses of FFC products identified in the Report to Congress are environmentally sound and do not constitute waste management. (USWAG00275)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by

Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (FW00277)

As set forth in its initial comments, CIBO asserts that available scientific, analytic, demonstrative, and other data clearly sustain the conclusion that no aspect of the substances addressed in the RTC should be subjected to national Subtitle C regulation. Further, sound RCRA policy requires this outcome. Environmentally protective reuse policies for the wastes covered by the RTC exemplify the resource conservation and recovery that Congress encourages in RCRA. *See, e.g.*, 42 U.S.C. 6901(a), 6902(10). Further, that States have overseen through regulation and monitoring the development of successful environment-protective reuse policies of these wastes also fulfills Congress's goal of active State participation. *See e.g.*, 42 U.S.C § 6902. The extension of federal Subtitle C authority over environmentally-effective reuse policies would undermine the core objectives of RCRA. CIBO asserts that all available data demonstrates that all wastes and applications covered by the RTC should remain under the Bevill exemption. (CIBO00280)

It has come to the committee's attention that the U.S. Environmental Protection Agency is considering regulations to require waste coal ash used in mine reclamation efforts to be managed as hazardous waste. We are writing to express the committee's concerns with this proposal, particularly as it would seriously affect Pennsylvania's efforts to reclaim abandoned mine land and alleviate acid mine drainage problems. (PA00293)

I am writing to express my concern about the Environmental Protection Agency's (EPA) March, 1999 report to Congress entitled Wastes from the Combustion of Fossil fuels. The report states that EPA lacks sufficient information with which to adequately assess risk associated with the use of waste coal ash in mine reclamation, and as a result is considering regulating such use under RCRA. (PA00296)

I urge you to carefully review the materials sent by DEP. If you do so, I am confident that EPA will see that there is no justification for expanding RCRA to include waste coal ash used for mine reclamation. (PA00296)

I am writing this letter to the agency in order to express my concerns with the conclusions contained within the EPA's second "Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants". Some of the conclusions reached in that report are inconsistent with the EPA's recognition that waste coal ash is not a hazardous material and is exempt from regulation while the agency is continuing to consider the regulation of waste coal ash used beneficially in mine land reclamation and as a soil amendment in agricultural applications as a hazardous waste material. (GPC00297)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (KCC00298)



I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (SMC00299)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (PA00300)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (PA00301)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (PA00302)

I wish to express my concern regarding recent attempts by the United States Environmental Protection Agency to regulate waste coal ash as a hazardous waste material under the Resource Conservation and Recovery Act (RCRA), as detailed in the EPA's second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Such a move will prove deleterious to Pennsylvania's environmental and economic well being. (PA00305)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (ACV00307)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (TEGI00308)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (PA00368)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (AMI00372)

We are writing on behalf of the Pennsylvania Senate Environmental Resources and Energy Committee to express our concern over the Environmental Protection Agency's (EPA) conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet it also determined that its use in mine reclamation or agricultural amendments should be regulated and managed as hazardous waste. (PAL0001)

Despite the positive findings on most beneficial uses of coal ash, the Report recommends increased regulation for the use of coal ash in agricultural applications and makes no recommendation for the placement of coal ash in closed mines for such beneficial purposes as controlling acid mine drainage. In both cases, I believe EPA should look to the states for regulatory oversight of these activities. (BCHRL0002)

The Ohio River Basin Commission would like to express its support of the continued use of waste coal ash in mine reclamation efforts to improve downstream water quality. The Commission opposes the U.S. Environmental Protection Agency's efforts to regulate waste coal ash as a hazardous waste as considered in EPA's second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. (ORBCL0002)

I am writing on behalf of the Pennsylvania Mining and Reclamation Advisory Board (MRAB) to express our concern about a potential regulatory determination in the above-captioned proceeding that would effectively prohibit the use of ash from the combustion of fossil fuels for mine reclamation. Such a determination would be very detrimental to Pennsylvania's efforts to clean up our legacy of past unregulated mining. (PMRABL0003)

We are confident that the Agency will determine after balancing (1) the immediate and positive environmental impacts of using combustion ash for mine reclamation with (2) the hypothetical risk of contamination of a groundwater site over 3,000 years in the future at a receptor well located in the middle of the downgradient plume 150 meters from a reclaimed mine, that there is no justification for regulating ash used for mine reclamation as a hazardous waste. (PMRABL0003)

I have enclosed for your review a copy of correspondence dated 9 September 1999 addressed to you by Pennsylvania Department of Environmental Protection Secretary James M. Seif, requesting that you determine coal-ash and waste-coal ash in mine reclamation and agricultural projects as non-hazardous waste. Although I am not an expert in environmental issues, I defer to the expertise of Secretary Seif on this issue, and concur in the arguments he makes in his correspondence for the determination of this ash as non-hazardous. I respectfully request that you give careful consideration to Secretary Seif's analysis on this matter. (PAL0004)

We would like to express support for the continued use of waste coal ash in mine reclamation efforts to improve downstream water quality. We have significant concerns regarding the U.S.

Environmental Protection Agency's efforts to regulate waste coal ash as a hazardous waste, as considered in EPA's second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. (SRBCL0006)

We, the undersigned members of the Pennsylvania Coal Caucus, comprised of members of the Pennsylvania Legislature are writing to express our concern with a potential regulatory determination in the above-captioned proceeding the effectively would prohibit the use of ash from the combustion of fossil fuels for mine reclamation. Such a determination would be very detrimental to Pennsylvania's efforts to clean up our legacy of past unregulated mining. (PCCL0007)

We are confident that the Agency will determine, after balancing (1) the immediate and positive environmental impacts of using combustion ash for mine reclamation with (2) the hypothetical risk of contamination of a groundwater site over 3,000 years in the future at a receptor well located in the middle of the downgradient plume 150 meters from a reclaimed coal mine, that there is no justification for regulating ash used for mine reclamation as a hazardous waste. (PCCL0007)

The classification of CFB ash under RCRA will be counter productive to the future ecological and human health of the region. I urge the EPA to allow the beneficial use of CFB ash to continue to be regulated under the context of SMCRA. (LRCAXXXX)

If EPA allows the utilities to continue and expand the dumping of CCW into coal mines, future generations of coalfield residents will face the added injustice of living with ground water that is too polluted to drink or use for farming and other economic activities and they will have every reason to lay the responsibility on EPA, the one government agency solely charged with protecting their health and environment. (HEC00056)

Using strip mines as open dumps for nonmine wastes is illegal. The Report downplays the significance of problems with minefills. (HEC00056)

The risk assessments do not even attempt to calculate the risk from dumping large volumes of fossil fuel wastes directly into ground water, an alternative that is being promoted aggressively by the electric power industry to minimize its disposal costs. (HEC00056)

EPA should regulate CCW disposed in mines under RCRA Subtitle C, as hazardous waste. Only this designation will keep aquifers in mine areas from becoming open dumping grounds. (CITZ00256)

I think you should think about this and Please don't let the coal mines dump the CCW in their coal pits. (CITZ00257)

p.s. Please! Please! Stop this dumping and let the Power Plants worry about a dump site. (CITZ00257)

EPA should regulate CCW disposed in mines under RCRA Subtitle C, as hazardous waste. Only this designation will keep aquifers in mine areas from becoming open dumping grounds. (VWI00258)

I would offer the following:

1. A rubble-filled hole blasted into coal geology is one of the worst places on the planet to put anything that you do not want infiltrating into the groundwater regime.
2. EPA must develop a program to routinely split samples and check operator-submitted information or do its own testing. (NPCA00259)

The EPA must ... regulate CCW disposed in mines under the federal Resource Conservation and Recovery Act (RCRA) Subtitle C, as a hazardous waste. (CITZ00260)

EPA should regulate CCW disposed in mines under the federal Resource Conservation and Recovery Act (RCRA), Subtitle C, as a hazardous waste. ONLY THIS WILL PREVENT AQUIFERS IN MINES FROM BECOMING OPEN DUMPING GROUNDS. (CITZ00261)

I think relying on the strip mining industry to police itself is not a good course of action. Returning it to former strip mines is adding insult to the injury they've already done to the land. These wastes seeping into the groundwater and possibly commingling other industrial wastes with them is not a good plan. It smacks of former Vice President Quayle's council on industry negating your agency's authority during his term in office. Strip mining is not an acceptable practice to begin with, but to allow this industry that has already devastated the land to return to damage it further is not acceptable. If they're not willing to accept the responsibility to find a better way to get rid of their waste, then don't let them ruin the groundwater more than they already have. Don't let them get away with this and making a laughingstock of your agency's mission. (CITZ00262)

EPA should regulate CCW disposed in mines under RCRA Subtitle C, as hazardous waste. Only this designation will keep aquifers in mine areas from becoming open dumping grounds. (CITZ00263)

EPA should regulate CCW disposed in mines under RCRA Subtitle C, as hazardous waste. Only this designation will keep aquifers in mine areas from becoming open dumping grounds. (CITZ00264)

Disposal of CCW in strip mines should be regulated under RCRA Subtitle C and meet the requirements for hazardous waste. Without this protection in place, individual states will allow millions of tons of CCW to be dumped and come into direct contact with groundwater. (CITZ00265)

EPA should regulate CCW disposed in mines under RCRA Subtitle C, as a hazardous waste. Only this designation will keep aquifers in mines from becoming open dumping grounds. (SAVV00266)

Mine disposal of CCW's should be regulated by RCRA Sub c, with liners between CCW's and all known aquifers. (CITZ00267)

I am writing to urge the EPA to strictly regulate the disposal of coal combustion waste (CCW), including stopping the disposal of CCW in strip mines. (CITZ00271)

We would rather pay a little more for our electricity than to drink contaminated well water if that is the price for handling CCW properly and safely. (CITZ00271)

EPA should regulate CCW disposed in mines under RCRA Subtitle C, as hazardous waste. Only this designation will keep aquifers in mine areas from becoming open dumping grounds. (SIERRA00278)

EPA should regulate CCW disposed in mines under the federal resources Conservation and Recovery Act (RCRA), Subtitle C, as a hazardous waste. (SOCM00279)

EPA should recommend that Congress ban any future dumping of CCW in lagoons, surface impoundments, landfills, old stripmine sites, or any other CCW disposal sites. (SOCM00279)

Commenters believe that sufficient evidence exists to warrant an immediate Nationwide moratorium on further co-disposal of coal combustion wastes in mine voids and pits under Section 7003 of RCRA, and for the assertion of Subtitle III authority over the disposal of coal combustion wastes in mine pits and voids. (NCCLP00282)

The available evidence provides a sufficient basis for assertion of Subtitle III jurisdiction to prevent further damage from open dumping of coal combustion wastes in mined areas. (NCCLP00282)

The failure to assert jurisdiction over coal combustion wastes disposed of in coal mining operations will result in imminent and substantial endangerment to health and the environment. (NCCLP00282)

Failure to establish appropriate disposal standards for coal combustion wastes in mining areas will disadvantage proper on-site utility waste disposal practices. (NCCLP00282)

Blending of mine wastes with spoil in the backfill, rather than controlled placement of the wastes in a designed facility, should be treated as prohibited open dumping. (NCCLP00282)

The hydrogeology of coal-bearing regions creates heightened risk of contaminant migration and groundwater contamination; justifying application of Subtitle III. (NCCLP00282)

Ample hydrologic evidence is available to suggest that further co-disposal of coal combustion wastes should be prohibited pending development of sufficient standards for the characterization, management, placement and monitoring of such disposal, and that EPA should move promptly to develop such standards. (NCCLP00282)

EPA should regulate CCW disposed in mines under the federal Resource Conservation and Recovery Act (RCRA) Subtitle C, as hazardous waste. Only this will keep aquifers in mines from becoming open dumping grounds. (CITZ00284)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (KYC00285)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00286)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00287)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00288)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00289)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00290)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00291)

I feel that stronger placement, monitoring and containment regulations are needed to encourage proper disposal of CCW's. (PURD00294)

Until conclusive results are obtained, I would also hope that the EPA would attempt to minimize potential harm to the U&public by discouraging dumping of CCW's in groundwater, encouraging the use of liners and monitoring systems, and adopting the treatment of CCW's as regulated materials under RCRA Subtitle C requirements for hazardous until wastes until long-term, unbiased data is collected. (PURD00294)

Tri-State is asking the EPA to regulate CCW disposed in mines under the federal Resource Conservation and Recovery Act Subtitle C, as hazardous waste. Many of our members live in rural areas and depend on groundwater for their private water supplies. Without strict regulations, surface and underground mine sites will become dumping grounds for these hazardous wastes. (TRI00295)

Hold those who benefit from CCW disposal responsible for any damages it causes. It is the utilities and mine operators that should be financially responsible for damage cause by CCW dumping. Not taxpayers. (CITZ00303)

I am opposed to any policy that allows dumping of power plant wastes directly into ground waters. (CITZ00304)

RCRA is appropriate here. A portion of the profits these companies have taken out of these regions must be returned to genuinely restore them, and to adequate/y isolate the hazardous wastes their industry has created. We must stop using the coalfields as hazardous dumping grounds. Our kids deserve better than that. Even after all this time, the people expect and hope for protection from your agency. (PEACE00306)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00311)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00312)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00313)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00314)

I request that the EPA regulate CCW disposed in mines under the federal Resource Conservation and Recovery Act (RCRA) Subtitle C, as a hazardous waste. Only this will keep aquifers in mines from becoming open dumping grounds. (CITZ00315)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00316)

I am concerned about the proposed state rule in Indiana which would allow for dumping of Coal Combustion Wastes (CCW) into the strip coal mines here in southwestern Indiana with direct contact with ground water. After analyzing both sides of the conflict, I believe that there are too many questions unanswered to allow this method of disposal to be used. (CITZ00317)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00318)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00319)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00320)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00321)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00322)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00323)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00324)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00325)

EPA should regulate CCW disposed in mines under RCRA Subtitle C, as a hazardous waste. (CITZ00326)

CCW dumping should be regulated under RCRA Subtitle C (hazardous waste). (CITZ00327)

It will be grave mistake if the US Environmental Protection Agency does not formulate rules for the disposal of various waste in pits caused by surfacing mining operations. These rules are



necessary to ensure that one of our most valuable resources (drinking water) is protected forever. (CITZ00328)

I object to allowing the dumping of Coal Combustion Waste (CCW), on open land from which our water table is replenished. In our area old coal mine areas being reclaimed are being used by the State of Indiana, as well as working mines are being used to dispose of millions of tons of solid waste from power plants in our area as well as waste being shipped in from other states ... Our water supply will be ruined for future generations. This is all taking place because of the greed of the large corporations who will risk our future for a quick profit now. I believe it is your responsibility because of your high position to get control of this situation. Research has been done to find alternate methods but most cost a little more. Please require this practice to be regulated under RCRA Subtitle C requirements for hazardous wastes. (CITZ00329)

This letter concerns the disposal of coal combustion waste which is of great concern to me since I am surrounded by coal mines ... On the "surface" of it this is obviously unacceptable. Though it may involve only a few thousand of us (at first), we value our lives like everyone else! ... At a minimum, we must have liners, close groundwater monitors and regulation under RCRA Subtitle C to protect us. More basically, there needs to be more resource recovery to prevent toxic chemicals etc. from being dumped in the first place. (CITZ00330)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00331)

We request that US EPA regulate fossil fuel wastes including coal combustion wastes to be disposed in mines as hazardous waste under RCRA subtitle C. We ask that at a minimum, the risk mitigation alternative outlined in the draft Determination be applied nationally to all disposal sites for CCW and other fossil fuel combustion wastes, waste mixed with these wastes or wastes whose parent materials are combined with these wastes. We believe that the requirements for liners, leachate collection and ground water monitoring outlined under this alternative in the Determination are basic projections that must be afforded to the environment and/or citizens who live adjacent to or near sites where these wastes are disposed. (HEC00332)

CCW that is dumped into strip mining operations should be covered under RCRA Subtitle C regulations for hazardous substances. Liners, groundwater monitoring, and leachate collection systems should be required for the dumping of these materials. (BUCK00333)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (NCSEA00334)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00336)

I request that the EPA regulate CCW disposed in mines under the federal Resource Conservation and Recovery ACT (RCRA) Subtitle C, as a hazardous waste (because that's what it is). Only this will keep aquifers in mines from becoming open dumping grounds. (CITZ00337)

RCRA Subtitle C requirements for hazardous wastes should be applied to the practice of dumping CCW in strip mines. If this step is not implemented, it will give this state's Department of Natural Resources and the Natural Resources Council the green light to continue to move toward turning the Southwestern corner of this state into the industrial dumping ground for the region's power companies. (CITZ00338)

First, I believe that RCRA Subtitle C requirements for hazardous wastes should be applied to the practice of dumping CCW in strip mines. If this step is not implemented, I believe that it will send the wrong message to Indiana and other states, namely, that they can dump any amount of CCW into direct contact with ground water and not have to worry about the consequences. (CITZ00339)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00340)

I am a resident that has lived in close proximity of coal mines for several years ... I am convinced that open dumping of CCW that has no restrictions on it is poisoning my drinking water ... Why the same safeguards are not required by coal operators as any other waste handling businesses are required is a mystery. Minimum Federal Regulations are essential to protect me from these wealthy powerful entities ... I am all for any regulations governing the handling and disposal of Coal Combustion Waste properly. (CITZ00342)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00343)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00344)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00345)

EPA should regulate coal combustion waste disposed in mines under the Federal Resource Conservation and Recovery Act (RCRA) Subtitle C, as a hazardous waste. This would prevent aquifers in mines from becoming open dumping grounds. (CITZ00346)

I am writing to urge the EPA to strictly regulate the disposal of coal combustion waste (CCW), including stopping the disposal of CCW in strip mines. (CITZ00347)

We would rather pay a little more for our electricity than to drink contaminated well water - if that is the price for handling CCW properly and safely. (CITZ00347)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00348)

EPA should regulate CCW disposed in mines under RCRA Subtitle C, as a hazardous waste. Only this designation will keep aquifers in mines from becoming open dumping grounds. (CITZ00349)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00350)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00351)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00352)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00353)

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The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions

of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00356)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00357)

The fact that CCW was declared “non-hazardous” some years ago has worked against us securing proper controls over dumping CCW in open pit mines in the State of Indiana. My first request is that U.S. EPA right this wrong and designate CCW as HAZARDOUS WASTE as the first step toward prevention of aquifers in mines from becoming open dumping grounds. (CITZ00358)

This letter is a request for detailed and stringent regulation regarding the disposal of Coal Combustion Waste in America ... Our coal mining sites already contain many dangerous substances, whether occurring naturally or introduced by man, and any additional toxic or hazardous wastes would only serve to compound our problems and increase the threat to our water resources ... We ask you to find that CCW is a hazardous or toxic waste and that it must be handled and disposed of as such. (DCCC00359)

At this point and time I believe that it would be criminal to allow CCW to be dumped into open strip pits with the amount of outstanding evidence that is being presented to you at this time. (CITZ00360)

At this point and time I believe that it would be criminal to allow CCW to be dumped into open strip pits with the amount of outstanding evidence that is being presented to you at this time. (CITZ00361)

What will it take for someone to stand up and act in a responsible manner and insist that the EPA (will) regulate the disposal of CCW in active mines under RCRA Subtitle C, as a hazardous waste. By making this change now, (you) will prevent further ground water contamination in our state. (CITZ00361)

At this point and time I believe that it would be criminal to allow CCW to be dumped into open strip pits with the amount of outstanding evidence that is being presented to you at this time. (CITZ00362)

What will it take for someone to stand up and act in a responsible manner and insist that the EPA (will) regulate the disposal of CCW in active mines under RCRA Subtitle C, as a hazardous waste. By making this change now, (you) will prevent further ground water contamination in our state. (CITZ00362)

At this point and time I believe that it would be criminal to allow CCW to be dumped into open strip pits with the amount of outstanding evidence that is being presented to you at this time. (CITZ00363)

What will it take for someone to stand up and act in a responsible manner and insist that the EPA (will) regulate the disposal of CCW in active mines under RCRA Subtitle C, as a hazardous waste. By making this change now, (you) will prevent further ground water contamination in our state. (CITZ00363)

At this point and time I believe that it would be criminal to allow CCW to be dumped into open strip pits with the amount of outstanding evidence that is being presented to you at this time. (CITZ00364)

What will it take for someone to stand up and act in a responsible manner and insist that the EPA (will) regulate the disposal of CCW in active mines under RCRA Subtitle C, as a hazardous waste. By making this change now, (you) will prevent further ground water contamination in our state. (CITZ00364)

At this point and time I believe that it would be criminal to allow CCW to be dumped into open strip pits with the amount of outstanding evidence that is being presented to you at this time. (CITZ00365)

What will it take for someone to stand up and act in a responsible manner and insist that the EPA (will) regulate the disposal of CCW in active mines under RCRA Subtitle C, as a hazardous waste. By making this change now, (you) will prevent further ground water contamination in our state. (CITZ00365)

At this point and time I believe that it would be criminal to allow CCW to be dumped into open strip pits with the amount of outstanding evidence that is being presented to you at this time. (CITZ00366)

What will it take for someone to stand up and act in a responsible manner and insist that the EPA (will) regulate the disposal of CCW in active mines under RCRA Subtitle C, as a hazardous waste. By making this change now, (you) will prevent further ground water contamination in our state. (CITZ00366)

At this point and time I believe that it would be criminal to allow CCW to be dumped into open strip pits with the amount of outstanding evidence that is being presented to you at this time. (CITZ00367)

What will it take for someone to stand up and act in a responsible manner and insist that the EPA (will) regulate the disposal of CCW in active mines under RCRA Subtitle C, as a hazardous waste. By making this change now, (you) will prevent further ground water contamination in our state. (CITZ00367)

EPA should ensure the objectivity, accuracy, and completeness of this report by ... regulating CCW disposed in mines under RCRA Subtitle C, as a hazardous waste. Only this designation will keep aquifers in mines from becoming open dumping grounds. (POW00369)

I am also asking that you, the EPA to keep us, the public informed by making regular tests close to the mines and publishing the reports of the results. When the tests show dangerous levels of

chemicals in a well it must be up to the responsible company to clean it up, not the taxpayers. (CITZL0008)

I am concerned about new plans to dispose of 125 million tons of coal combustion waste in unlined Indiana mines... Please issue a national rule requiring that action be taken to protect our drinking water. (CITZL0011)

PG&E's comments consider a legitimate, if overstated, application of a specific waste type for a specific beneficial use in a specific setting. The specificity (and limits) of these applications is lost in the rhetoric. The comments create the impression that CCW wastes in general have these properties and that anything short of USEPA's turning loose of regulation will prevent a tremendous landscape of beneficial applications from being realized. It is important that distinction between legitimate, engineered beneficial use and unregulated, wholesale dumping continually be drawn and emphasized. (GHIL0012)

In addition, I believe the EPA should regulate CCW disposed in mines under RCRA Subtitle C, as a hazardous waste. Only this designation will keep aquifers in mines from becoming open dumping grounds. (CITZL0013)

I think relying on the strip mining industry to police itself is letting the fox into the henhouse. Allowing coal combustion wastes to be returned to former strip mines is adding insult to the injury they've already done to the land. These wastes seeping into the groundwater and possibly commingling other industrial wastes with them is an unacceptable answer. It smacks of former vice president Quayle's council on industry negating your agency's authority. Strip mining is not an environmentally acceptable practice to begin with. (CITZL0015)

Many utilities will not allow their wastes to be co-disposed in mine voids and workings, preferring to manage their liabilities associated with the waste *on-site* or in a manner more controlled than the typical Minesites. Those that do allow the waste to be managed in co-disposal situations assume that the problems with their wastes will be masked by the significant hydrogeologic and chemical disruptions associated with mining operations, or that the contamination will not be discovered because of lack of adequate and sufficient monitoring. In many cases, they are correct, and absent EPA intervention, such practices will be encouraged, placing those engaging in more careful, controlled disposal, at competitive disadvantage. (NCCLP00282)

Coal strip mines could become the dump of choice for power plants and many other industries. (CITZ00284)

Without strict regulations, surface and underground mine sites will become dumping grounds for these hazardous wastes. (TRI00295)

The Report discusses a trend toward lined landfills, but failed to mention the move toward mine disposal sites that would offset this trend particularly if the move toward deregulation of electricity sales continues in the utility industry. (HEC00332)

Given the number of underground mineshafts, this form of disposal could handle a great deal of the fossil fuel waste generated in this country. Before any decision is made to allow mine disposal there must be well-documented answers to questions about how the toxic constituents in these waste will affect ground and surface waters. In collecting data, all quality scientific data should be used to answer these questions. In the absence of data, EPA should not be allowing mine disposal. EPA should look at each of these minefilling practices individually and not lump them together. The Agency must develop a systematic study protocol to raise the right questions, figure out if the data is available and if it is not available, support appropriate studies. The lack of data must not be used to mean that no problems exist. (ALA00036)

And we believe that any acceptable minefilling practice must be federally regulated. Federal regulation would provide a common framework for determining under what circumstances any FFC wastes might be disposed of underground. (ALA00292)

MCC has gone through the permitting and approval process in Maryland and currently uses fossil fuel combustion wastes as minefill and soil amendment ... The project is properly monitored and regulated by two (2) Maryland entities, and should not be regulated under RCRA Subtitle C. (MCC00051)

## **VII. MINEFILL**

### **A. Information Provided**

As noted above, commenters provided detailed information on minefill regulations in specific states, case studies, factors determining risks from the practices, costs and benefits of the practice, and other research materials. In some cases, commenters made specific suggestions as to factual issues the Agency should consider in coming to its final determination.

Response: EPA thanks the commenters for the extensive information provided. As noted in the general response to Section VII, above, EPA completed its analysis of all this information, along with the information previously collected in support of the Report to Congress. This analysis was a major contributor to today's decision. Most, if not all, of the specific "informational" comments below are addressed in the analytical response just above. The results of EPA's analysis are discussed further in the responses below and presented in the final Docket for this determination. Documents in the docket that summarize two specific categories of information are: "Summary of Coal Combustion Waste Minefill Projects in the U.S." and "State Regulation of Mine Placement of Coal Combustion Wastes."



**VII. MINEFILL**  
**A. Information Provided**  
**Verbatim Commenter Statements**

CCP placed as minefill represent less than 1% of the total disturbed material at the mine site.  
(IEU00018)

Prior Act 1986-1 68, which amended Pennsylvania's Solid Waste Management Act, coal ash was handled as a type of residual waste under 25 Pa. Code Chapter 75 of PaDEP's regulations. The 1986 Amendment excluded coal ash that is beneficially used from the definition of solid waste. Coal ash is defined as "fly ash, bottom ash or boiler slag resulting from the combustion of coal, that is or has been beneficially used, reused or reclaimed for a commercial, industrial or governmental purpose." The 1986 Amendment also defined the scope of beneficial use of coal ash to include mine subsidence, mine fire control, mine sealing and minefill in lieu of natural borrow materials or minespoils. Specific new regulations for the beneficial use of coal ash were promulgated by the Environmental Quality Board in 1992 and recently amended based upon the first five years experience with beneficial use of coal ash under the regulatory program. 25 Pa Code § 5287.661 through 287.666. The beneficial use regulations authorize the use of coal ash as part of mining reclamation activity if designed to achieve an overall improvement in water quality or prevent the degradation of water quality. Ash may be used beneficially to fill a pit or area from which coal is extracted under a surface coal mining permit, an abandoned coal mining area located within the surface coal mining permit area, permitted coal refuse disposal site and other beneficial uses that are part of the approved reclamation plan of the coal mining activity. 25 Pa. Code 5287.663 (c). The regulations also require coal ash used as a soil substitute or soil additive to be applied at a rate per acre that will protect public health, safety and the environment, and to be carried out pursuant to an approved reclamation plan to increase the productivity or properties of the soil. 9287.663(e). The regulations require the development of technical guidelines to facilitate review of proposed ash use at a mining site, which establish specific contaminant limits for metals including arsenic. Minefill in surface mines (including coal refuse disposal) is subject to the Surface Mining Control and Reclamation Act, the Coal Refuse Disposal Act and the Clean Streams Law, as well as the residual waste regulations. Section H of the residual waste regulations specifically sets forth procedures for the conventional placement of coal ash at minesites (25 Pa. Code §§ 287.663-287.664) which include:

- ash delivered to the mine must have a pH between 7 and 12.5, and cannot produce a leachate that exceeds DEP's Class III limits, which DEP has established as safe for unlined, natural attenuation facilities.
- ash must be separated from groundwater, highwalls and other consolidated rock features.
- ash must be delivered to the site within an acceptable moisture range and compacted in layers not exceeding two feet in thickness.
- groundwater must be monitored. (ARRIPA00019)

Over the last decade, DOE/FETC has conducted and published extensive empirical research to examine potential detrimental effects that FFC waste may have when it is used as mine fill. EPA has requested this type of data and analyses in its RTC. DOE believes that the research summaries provided by its FETC in the detailed comments that follow will greatly assist EPA in making a fair

and scientifically based regulatory determination on waste disposal and beneficial uses of coal combustion waste (CCW). DOE's research in this area (which is summarized in matrix form in Appendix 1), includes:

- Data collection and analysis of water quality data collected from 35 surface mines in Pennsylvania where CCW were used for backfill and surface reclamation. These data showed a general lack of environmental damage. DOE has also produced summaries of in-house research where the injection of CCW grouts into surface mine spoils produced neutral to slightly positive environmental effects.
- Several field projects involving the injection of CCW into abandoned underground mines for the purpose of acid mine drainage (AMD) remediation and/or subsidence control.

Supporting documentation and data from each of these studies are provided in the body of these comments... [the comment provides several pages summarizing the results of its research]. (DOE0020)

There are several conferences which have had sessions which address the use of coal ash in mining, among these are ACAA's biannual International Symposium on the Management and Use of Coal Combustion Products, and the biannual International Ash Use Symposium organized by the University of Kentucky, Center for Applied Energy Research (CAER). The American Society for Surface Mining and Reclamation often has a session on ash use in mining at its annual meeting. In 1996 the United States Office of Surface Mining, Sponsored the Coal Combustion By-Products Associated with Coal Mining - Interactive Forum which was held at Southern Illinois University at Carbondale. These meetings provide for the dissemination of information on the topic of coal ash use in reclamation ... [the comment presents several pages summarizing the results of scientific studies and detailed information on state programs] (ACAA00022)

Several of the documents that have been referenced in the preceding comments concerning U.S. EPA's March 1999 Report to Congress on Wastes from the Combustion of Fossil Fuels are included as attachments to this submission to EPA Docket Number F-1 999-FF2P-FFFFF as follows:

- Attachment #2 - List of technical papers concerning mining applications of CCPs (14 pages)
- Attachment #4 - State Solid Waste Regulations Governing the Use of Coal Combustion Products (CCPs), ACAA, August 1998 (57 pages) [Also available on DOE/FETC Internet web site]
- Attachment #6 - Excerpted information from selected state regulations and related documents concerning the management and use of CCPs in mining applications (25 pages) (ACAA0022)

PG&E Gen has attached case study information and permit information in this report to help understand the level of control that state regulations have placed on the electric generating industry ... Attached in Appendix A is permit information regarding PG&E Gen's Carneys Point ash which is used for minefilling at Blackville mine in Greene County, Pennsylvania. The Logan Generating Plant also uses its pulverized coal ash to reclaim coal mines. Approximately 77 percent of Logan's

coal ash and 93 percent of Carneys Point coal ash is beneficially used in mine reclamation. The reclamation activities are conducted under the auspice of various state and federal agencies. (PG&E00023)

Coal ash from the Carneys Point facility is used as a minefill reclamation in Pennsylvania. EPA's review of the regulatory requirements for minefills does not include the requirements for quality certification of the coal ash, as do Pennsylvania's residual waste regulations for the beneficial use of coal ash at mine sites, 25 PA Code Section 287.661-665. These requirements are quite expensive in terms of testing, operational controls and monitoring and are further strengthened by the overlapping mining regulatory program permits and requirements. These regulations are discussed in greater detail in these comments on Section 5.5, and copies of the permitting modules implementing key beneficial use of coal ash requirements are found in Appendix B. (PG&E00023)

As noted in section 3.4 above, PG&E Gen's Carneys Point and Logan facilities in New Jersey beneficially reuse their ash in mine filling projects in Pennsylvania and West Virginia, pursuant to the regulatory programs discussed in some detail in Chapter 5.5. EPA mentions its concerns regarding agricultural use and mine filling of ash and requests further information as to case study experience with these practices. Specific information on the Carneys Point project is provided in Appendix A. (PG&E00023)

The three PG&E Gen facilities produce about 1 million tons of FBC ash annually. The two Pennsylvania facilities beneficially reuse 100 percent of their FBC ash; about 99 percent is minefill and grouting material and 1 percent is used in soil amendments for revegetation of mine sites. The Cedar Bay facility beneficially reuses about 6 percent of its FBC ash in soilamendments as an input in the manufacture of lime-stabilized municipal sewage sludge Class A biosolids; the remaining 94 percent is disposed in a lined landfill permitted under Kentucky's waste management program ... EPA requested specific information and case studies on the experience with beneficial uses of FBC ash for minefilling and soil amendment. PG&E Gen selected several different types of beneficial use projects to present here... [the commenter presents several pages of case study information]. (PG&E00023)

Pennsylvania regulates mining activities pursuant to its air, water, waste and mining laws, and implementing regulations and guidelines ...The beneficial use regulations, found at 25 Pennsylvania Code Chapters 287.661-665 require the applicant to demonstrate, among other things, that the quality of the coal ash meets certification guidelines for 20 contaminants, including arsenic and mercury. The applicant is also required to demonstrate that the beneficial use is designed to achieve an overall improvement in water quality or to prevent degradation of water quality, and that groundwater is monitored in accordance with the requirements of federal and state mining laws. (See attached copies of regulations and implementation guidelines in Appendix B.) ... [the commenter presents several pages of information summarizing Pennsylvania state regulations]. (PADEP00025)

In an effort to aid in your decision-making process, we are pleased to provide a representative sampling of data from the nearly 100 mine sites throughout Pennsylvania where ash has been used as a supplement for soils or minefill. These cases cover a variety of applications. We believe that the data demonstrate that the use of ash does not result in groundwater degradation when used in accordance with the regulations and guidance in effect in Pennsylvania. This result is the same

whether the ash placement is within or above the water table. In many of the cases cited, the use of the ash resulted in a significant improvement in water quality. The information is presented in three volumes. Volume 1 provides an overview of the beneficial use of ash in Pennsylvania, includes our regulations and guidance documents; and provides limited information on the use of ash as a soils amendment. Volume 2 includes data from seven sites where the ash placement is not in contact with groundwater. Finally, Volume 3 includes data from five sites where the ash is in contact with groundwater. (PADEP00025)

In particular, I am responding to the Report's request for additional information on the potential for beneficial use of Coal Combustion Products (CCPs) in mined land environments ... [the commenter presents several pages summarizing scientific studies]. (VAT00033)

Finally, I would like to support the recently developed regulatory framework for beneficial utilization of CCPs in the various states. In Virginia, for example, our Regulation Governing Management of Coal Combustion By-Products (VR 672-20-20) exempts eligible CCPs from regulation as solid waste when they are beneficially used or recycled for specific purposes ... [the comment presents several pages summarizing Virginia regulations]. (VAT00033)

In specific response to EPA's request for scientific documentation on the potential for beneficial reuse of CCPs in mined land environments, I am submitting attached copies of the papers by Haering and Daniels (1991) and Stewart and Daniels (1997), and the 1996 Ph.D. dissertation by Stewart. These materials contain extensive references on the beneficial reuse potential of coal fly ash in mined land environments along with detailed coverage of the environmental concerns and appropriate management practices. (VAT00033)

In mine reclamation, coal wastes are often mixed with other residuals i.e. biosolids to produce a low-cost, soil substitute that can be placed on mined surfaces to promote revegetation. In using wastes for this purpose, the benefit is that revegetation is promoted on sites that are viewed as having low value. In using coal waste for this purpose, the question that needs to be answered are: Can these wastes support vegetation with levels of application that do not further degrade the environment? (ALA00036)

This is an issue not only for the long-term mobility of metals but also when trying to understand the length of time that these wastes will be able to neutralize acid drainage before the alkaline cations in the wastes are leached out. If and when leaching occurs, how will this change metal mobility and transport and what will need to be done to "recharge" the neutralizing capacity? (ALA00036)

Mining states are aggressively pursuing innovative mine placement strategies to address longstanding environmental problems. In Pennsylvania, for example, the State's mine placement initiatives range from conventional placement, which is subject to very specific regulatory requirements governing ash quality and placement to innovative CCP utilization, such as in the reclamation of crop lands, coal refuse banks and water-filled strip mine pits. These research reclamation projects are being performed as demonstration projects and involve significant testing, research and monitoring measures to ensure the placement of coal ash is safe to the environment. (USWAG00037)

The State of Maryland provides another example of a state that is actively researching the prospects for greater beneficial uses of coal combustion projects. The Western Maryland Coal Combustion By-Products/Acid Mine Drainage Initiative is a successful example of a demonstration carried out through a joint private and public sector collaboration. The Maryland Department of Natural Resources Power Plant Research Program, with participation from the Maryland Department of the Environment Mining Program, coal mining companies, and electric utility companies, has coordinated research to evaluate the use of alkaline CCPs to abate AMD from underground coal mines. As part of this initiative, a field scale experiment was established at the Frazee Mine in Garrett County, Maryland in November 1996. Approximately 5,600 cubic yards of grout, which consisted of 6,000 tons of CCPs and 52,000 gallons of acidic mine water, were injected into both dry and submerged mine conditions. The State is monitoring the mine to evaluate the effectiveness of the grout to seal the mine and abate AMD, and to make sure ground water is not adversely impacted. The ultimate goal of this research is to use CCPs to address the 6-square-mile underground Kempton mine complex, which discharges approximately 6 million gallons per day of AMD into the Chesapeake Bay watershed in Maryland. (USWAG00037)

USWAG surveyed member companies for information to help EPA evaluate this preliminary concern. The data and case studies are compiled in the attached draft EPRI report, Synthesis of Available Information on the Management of Coal Combustion Products (CCPs) in Mines ("EPRI Synthesis Report"). USWAG provided a preliminary draft of this document to EPA on March 1, 1999. The EPRI Synthesis Report describes some electric utility industry experience with mine placement of CCPs in cooperation with and under the supervision of State, local, and federal regulatory agencies. The case studies represent a significant portion of the total population of active mine placement projects nationwide. (USWAG00037)

The case studies in the EPRI Synthesis Report describe beneficial utilization of CCPs in surface and underground mines both above and below the water table. The monitoring data generally show no adverse environmental effects, and, indeed, sometimes document significant improvements. The following short descriptions are intended as a guide to the detailed information presented in the EPRI Synthesis Report... [the commenter provides several pages summarizing the case studies]. (USWAG00037)

Additionally, we would like to offer any data which EPA might need to demonstrate that mine placement of CCPs is an environmentally responsible beneficial utilization practice. (TVA00049)

However, much groundwater data does exist around mines with ash reclamation, especially in the state of Pennsylvania. Also, site-specific parameters needed for accurate groundwater transport modeling are available at these mine sites. (CIBO00052)

TXU has been a advocate, supporter and practitioner of mine placement of coal combustion wastes, appropriate beneficial utilizations, and recycling of coal combustion by-products in connection with our mining operations for well over twenty-five years. TXU owns and operates three lignite fired electric generating stations in Texas which we commonly call "mine-mouth operations". That is, the lignite surface mine is located adjacent to the electric generating plant. Historically, TXU has utilized the surface mines as the location for the disposal of coal combustion by-products (CCBPs) ... [the commenter provides several pages summarizing its projects and the applicable state regulations]. (TXU00053)

The following documents, referenced in our original comments (copy enclosed) are enclosed:

- “Injection of FGD Grout to Mitigate Acid Mine Drainage at the Roberts-Dawson Underground Coal Mine, Coshocton and Muskingum Counties, Ohio,” a seven-volume final report for a project which was carried out by The Ohio State University and American Electric Power. This is OCDO Project D-95-17.
- Attachment 3-These tables present data from “Product Development and Utilization of Zimmer Station Wet-FGD By-products,” (OCDO project D-931-8) being conducted by the Dravo Lime Company. Studies of this CCP used as a fertilizer on abandoned mine land (AML), on previously reclaimed mine land (RML) and on an acidic agricultural soil in Ashtabula County Ohio (AS) do not show any accumulations of arsenic in plant tissues. In Table 4 of Attachment 3, the arsenic content of the CCPs and limestone was less than 4 mg/kg in all cases. The remaining tables of Attachment 3 present plant tissue data from the three sites for one to two crop years. In all cases for both controls and treatments with CCPs, the arsenic content was less than 1.75 mg/kg and of no adverse environmental consequence. (ODOD00054)

While there are applications of CCW that can neutralize acid mine drainage, these applications must be exercised with adequate characterization of the ground water systems and the acidity at the site and of the CCW and its neutralization capacity. The treated sites must be monitored closely and for long periods of time. Repeat applications of CCW may be necessary. Without such measures, there is a growing body of evidence indicating that the metals in the CCW may be solubilized into the environment as the neutralization capacity of the CCW is exhausted. (HEC00056)

Yet after twenty years of telling us that they can readily meet these requirements, the proponents of minefilling now want us to believe that even in the absence of acidity problems, the ground waters in mines are so trashed that further contamination of them from disposal of massive quantities of CCW and other fossil fuel wastes would be of no consequence! The data does not back them up. Instead it indicates that contamination from disposal of CCW will substantially worsen water quality that has been degraded by mining. It shows that degraded spoil waters improve with time as their oxygen content reduces. It does not show that contamination from CCW will abate simply with the passage of time ... [the commenter provides several pages summarizing case study information]. (HEC00056)

Indiana is a good case study. We note that EPA has made a special effort to investigate Indiana's minefills in its tour of this state on May 25. For the past eight years, Indiana has aggressively promoted unrestricted open dumping in mines. As a result we are intimately familiar with the practices that this state is utilizing that violate mining law and will summarize the problems with Indiana's approach here. It is important to remember that these problems may be indicative of other states' approaches with minefilling as well ... [the commenter provides several pages summarizing Indiana's state regulations]. (HEC00056)

Site-specific regional characteristics and the suitability of Indiana surface mine environments are illustrated by the Little Sandy #10 mine site that was recently visited by USEPA representatives.

USEPA's May 25, 1999, observations revealed Indiana mine sites are dry due to very limited ground water intrusion caused by the local Indiana coal geology. Therefore, Indiana can take advantage of the Pennsylvanian-age cyclothems which are dominated primarily by highly impermeable shales with typically limited ground water capacity (~20 gallons/minute). In addition, the vertical proximity between the coal ash disposal locations and deeper aquifers is minimal. For example, the Little Sandy #10 site places ash on a 60 foot thick bench of shale material which provides an excellent attenuation zone for downward element migration. In addition, most Indiana coal mine geological environments can take advantage of a natural liner comprised of the immediate underclays or fireclay stratigraphic layers located directly beneath the lowest coal seams removed. Typically, several feet thick, highly impermeable underclays make up the base of the disposal environment. With hydraulic conductivities generally 10<sup>-10</sup> centimeters/second or less, these underclay units equal, or exceed, the standards for most liners constructed for land fills. Field data, which is provided in the appendices of this document, have confirmed the operation of these natural processes in surface mines. Indiana's data has shown when mine site geology and hydrology are properly considered, coal ash is environmentally benign and sometimes environmentally beneficial. Sites observed on the May 25, 1999, USEPA tour (i.e. the Cinergy Universal Mine site and the Midwestern Mining bond forfeiture reclamation project) have shown water quality improvements as a result of coal ash disposal in mine sites. For example, Monitoring Well #3 at the Cinergy, Universal Mine site is located downgradient and within less than 50 feet of the ash fill. Yet, water monitoring data shows it meets primary drinking water standards in nearly all samples. This is due to the unique nature of surface mine sites which make them well-suited to accept ash materials. Moreover, hydrologically connected acid mine discharge seeps have been neutralized by the coal ash facility. (IDNR00062)

As a prelude to the large amounts of attached data, the following pages contain substantial background information about the Indiana coal mine coal ash disposal program that will assist USEPA in its analysis and understanding of the data provided by the IDNR ... [the commenter provides several pages summarizing its regulatory program] (IDNR00062)

The DoR believes that dilution and attenuation factors, such as dispersion and adsorption, with respect to minefill in the backfill should be considered when EPA makes its final Regulatory Determination. (IDNR00062)

The DoR recommends that EPA consider providing guidance on alkalinity or pH levels at which metals are not expected to leach and guidance concerning levels which could produce unacceptable leachate concentrations. (IDNR00062)

The DoR also recommends that guidance be provided about whether or not the co-disposal of coal processing wastes with CCW in a reducing environment poses a threat and if co-disposal with acid forming materials or coal processing wastes should have specific limitations or prohibitions based upon the findings of Dr. Barry Stewart presented in Appendix 8. (IDNR00062)

The DoR recommends the EPA research reference material and make observations of strata associated with active coal mining operations to determine what extent fracturing occurs with respect to conduciveness of contaminant transport. Also, the DoR recommends the EPA determine the extent that underclays provide a suitable vertical barrier from CCW effects on aquifers that may exist beneath the floor of the mined area. (IDNR00062)

Today, however, mine reclamation is a major component of PP&L's ash management strategy. Since 1995, PP&L has increased the amount of coal ash beneficially used for mine reclamation from 65,000 tons in 1995, to over 320,000 tons in 1998. The beneficial use of coal ash as minefill has significantly reduced PP&L's ash handling costs. (PHS013)

The dramatic increase in the use of coal ash as minefill in Pennsylvania can initially be attributed to the 1986 amendment to the Solid Waste Management Act that revised the definition of solid waste to exclude coal ash that is beneficially used ... [the commenter provides several pages summarizing Pennsylvania's regulatory program]. (PHS013)

I'm concerned about the drinking water myself. I have <2> drilled wells of water close too a proposed dumpsite or with-in 1/4 mile, of my <2> wells in which I get water from these from my cattle and my family. (CITZ00257)

ICC is submitting this comment because it believes a more specific understanding of the Illinois basin geology and hydrology, particularly in the southwestern Indiana coalfields, and the formation and characteristics of mine spoil water (i.e. "groundwater" in the surface mined area) is helpful in understanding why it believes disposal below the water table is the preferred method of disposal in Indiana ... [The commenter provided several pages of specifics regarding case studies, hydrology of mine sites, and leachate data]. (ICC00269)

According to Jeff Stant of the Hoosier Environmental Council, eight wells in Illinois have been contaminated by CCW disposed of in strip mine pits. (CITZ00271)

Furthermore, the internal pore structure of the monolithic body yields permeability (hydraulic conductivity) in the range of 10<sup>-10</sup> cm/set; comparable to compacted plastic clays. Compacted FBC ash fills have measured "dense" or "very dense" using standard geotechnical study auger borings. (See, Preliminary Geotechnical Investigation, Alden Ash Site, January 1998, Kimball Associates, attached.) (PG&E000274)

A program developed under RCRA Section 3004(x) should, among other things, provide for:

1. Separation and proper disposal of other fossil fuel-related wastes, such as FBC wastes, that may contain residual unburned organics not associated with typical coal ash. Greater scrutiny is warranted for FBC waste, which as noted in the Boulding Report presents a higher potential for leaching elements of concern; and wastes generated through the firing of hazardous waste fuels and waste oils with or without coal, and those which are fired or co-fired with waste tires and refuse-derived fuel. Each of these categories adds constituents to the combustion process which may significantly increase the hazards of improper disposal of the waste, including a range of products of incomplete combustion of chlorinated and other synthetic organic compounds that warrant extensive analysis, characterization and careful management beyond that necessary for coal combustion waste. Clarification should also be provided that coal combustion wastes do not include utility wastes such as metal and boiler cleaning wastes, nor other wastes generated from power plants beyond those directly resulting from combustion of coal and control of emissions from the combustion process.



2. All coal combustion wastes to be screened for radionuclides and managed as low-level radioactive wastes in accordance with the applicable state and federal laws, where those wastes exhibit activity that is above background levels. Coal combustion waste which contains elevated radionuclides is properly classified as technologically-enhanced low-level radioactive waste.
3. No disposal should be allowed absent the complete characterization of the waste stream(s) proposed for land disposal, and assurance that the engineering design of the disposal facility will assure compliance with the environmental performance standards (including no contamination of aquifers above drinking water standards and no increase in groundwater of any constituents above background levels of those contaminants). Whenever possible the chemical and physical composition of the actual waste stream that will be produced by the combustion process at the utility from which the waste will be generated, should be used for testing.
4. In order to properly design a facility for disposal of coal combustion waste, the full extent of the characteristics of the waste must be known, and the leachate potential must be established by use of appropriate modeling of the disposal site, the amount of rainfall infiltration, the pH of the waste and associated materials through which the rainfall will pass, and a hydrogeologic investigation into the location, extent, and characteristics of the surface and groundwater systems at the site.
5. Groundwater monitoring must be sufficient to allow for prompt detection of leachate migration at the waste site (and not the mine) boundary. Monitoring parameters and well locations must be such that they are appropriate to the area in which the waste is disposed.
6. Blending of mine wastes with spoil in the backfill, rather than controlled placement of the wastes in a designed facility, should be treated as prohibited open dumping.  
(NCCLP00282)

The 1983 study by Kipp, Dinger and Lawrence, *A Conceptual Model of Ground-water Flow in the Eastern Kentucky Coal Field*, makes these observations concerning the nature and occurrence of fracture-dominated groundwater transport ... Borchers and Wyrick, *Application of Stress-Relief Fracturing Concepts for Monitoring the Effects of Surface Mining On Groundwater in Appalachian Plateau Valleys*, (1981) also note that "stress-relief fractures are a near-surface phenomenon" vastly different from the standard conceptualization of groundwater flow ... Summers noted that mining and restoration may either increase or decrease the recharge rate to groundwater from the mined area. Summers, *Measuring the Impact of Mining on Groundwater Recharge* (1981). The stress-relief fracture system was noted also by Ferguson, during his foundational investigations in the Allegheny Plateau Region on behalf of the Corps of Engineers. *Valley Stress Release in the Allegheny Plateau*, *Engineering Geology, Association of Engineering Geologists Bulletin*, Volume 4, No. 1, p. 63-68 (1967). Schubert noted that "fractures are of considerable importance to groundwater flow through lithified coal-bearing strata," relying on many different studies in the northern Appalachians and northern Great Plains ... As noted by Hobba, ground water and surface water are intimately related in the Appalachian coalfields, and underground mining and resulting subsidence increases hydraulic conductivity and interconnection of water-bearing rock units ... Hobba, *Effects of Underground Mining and Mine Collapse on the Hydrology of Selected Basins in*

West Virginia, (1981) ... [the commenter provides several pages summarizing these scientific studies]. (NCCLP000282)

However, we know of many examples where CCBs have been an integral part of successful reclamation under both Title IV and Title V. There is an extensive inventory of completed projects, and there are a number of ongoing projects in various stages of completion. As the EPA states in its report, the environmental benefits achieved through this reclamation have been extensive. In all of these projects, OSM and the States have ensured that the potential environmental and health and safety impacts of CCBs were evaluated. The enclosed copies of papers on successful reclamation were presented at national AML meetings highlighting the use of CCBs. (OSM283)

We have experienced first-hand the water contamination caused by various forms of coal mining. My students were amazed when they saw a creek near Freeburn, Kentucky with water that was a milky white. I am greatly concerned about the potential for even more groundwater contamination and the associated risks to human beings and other life forms if coal companies are allowed to continue the practice of dumping coal combustion waste (CCW) in strip mines. (CITZ00291)

Attached as Appendices B and C to these comments are the German laws (in German and English) that regulate minefilling of wastes, including coal-combustion wastes. We present this material as a model for EPA in considering whether and how to regulate the minefilling of the range of co-managed FFC wastes. (ALA00292)

Kerry Coal Company reclaimed an old coal wash plant site in Butler County, Pa. that covered over twenty acres using 250,000 tons of CFB ash. That site is now supporting a lush green habitat for wild life. This site was reclaimed at no cost to the commonwealth or the Pennsylvania taxpayer. (KCC00298)

Shamrock Minerals Corporation reclaimed 22 acres of an abandoned coal refuse site in Western Pa. using 70,000 tons of CFB in 1996. Today the water runoff leaving the site meets DEP standards and the field produces hay. The job was completed at no cost to the Pennsylvania taxpayer. (SMC00299)

One very experienced toxicologist looked at the lead levels alone in samples submitted by the generators themselves--they were in the tens of thousands of ppm--he said "They could mine this stuff for lead." (Dr. Karl Schurr, Professor Emeritus, Medical College of Ohio--now resident of Fisher, Pa.) Yet those ashes--and tons just as bad and worse-- were submitted as part of the example-plan for mixing in with the dredge muds from NY/NJ to spread on abandoned strip mines.(Consolidated Technologies, Inc) (PEACE00306)

There are a number of scientists concerned about flushing CCW into underground exhausted coal mine shafts due to trace metal toxicity from fly ash particles accompanied with high levels of conductivity, total dissolved solids (TDS), and sodium (Na). The last three parameters, by the way, do not have national water quality criteria (WQC) restrictions to protect aquatic life. I have found that effluents with conductivity approaching 4,000 : mhos/cm, 3,500 mg/L TDS and 1,100 : g Na/L to be acutely toxic to *Ceriodaphnia dubia* in my recent research efforts of the latter 1990's. (VAT00309)

These documents are attachments to the comments submitted under separate cover on behalf of the Citizens Coal Council, Citizens Interested in Bull Run, Inc., the Hoosier Environmental Council and the Kentucky Resources Council. (CCC00310)

Note: I am willing to testify as a private citizen, to your sub. Committee. I have information which the powers to be do not want to become public information. (CITZ00329)

Given the instability of mine sites as well as the direct and indirect hydrologic pathways between the wastes and groundwater supplies at these sites, disposing CCW, other fossil fuel wastes, other nonmine wastes mixed with these wastes or wastes whose parent materials are cogenerated with fossil fuels in strip mines without substantial safeguards violates the basic tenets of sound waste disposal policies. (HEC00332)

The connections between ground water in the mined site and deeper aquifers are complex and substantial. (HEC00332)

Studies provide evidence that contaminants in shallow aquifers directly or closely connected to surface mines could migrate to deeper aquifers relatively easily in certain situations. (HEC00332)

Coal mining has major impacts on groundwater quality and quantity that often extend far beyond the boundary of the mine area and permanently change the hydrologic regime for the surrounding region. We believe that if EPA decision-makers come to understand these impacts, they will have a sound scientific basis to effectively regulate dumping of coal combustion waste (CCW) in mines so that it will not damage our nation's precious groundwater resources. (HEC00332)

According to Jeff Stant of the Hoosier Environmental Council, eight wells in Illinois have been contaminated by CCW disposed of in strip mine pits. (CITZ00347)

In Virginia, there is a continuing attempt by industry to dump these wastes in old underground coal mines or incorporate them into reclamation materials on surface mines. To date, no such permission has been granted by the coalfield counties of far southwestern Virginia. (DCCC00359)

The Bureau suggests that further consideration of existing information gathered during this current review be compiled into an accessible database for consideration by carefully selected experts and potential users before any decision is made. Also, EPA could develop or recommend suitable evaluation standards and require the collection of vital and equivalent baseline information (toxicity tests, old and new methods, utilization of comparable research methods) on CCBs in mine environments. (MDE00047)

Maryland, for example, has two different entities within the Water Management Administration that regulate the use of coal combustion products in mine applications; the Water/Wastewater Permits Program and the Bureau of Mines. Although the Code of Maryland Regulations Title 26, Subtitle 13, Chapter 02, Section .04-1 defines coal combustion products as non-hazardous, the material must be approved for use by the Bureau of Mines and monitored for chemical content and environmental impact under an NPDES permit issued by the Water/Wastewater Permits Program. The Bureau of Mines approval process involves a rigorous chemical analysis of both the material and the potential leachate receptors. A copy of the application for approval is enclosed as

Attachment B. The Water Management Administration permitting process requires both a detailed chemical analysis of the material mimicking the RCRA Hazardous Waste characterizing process found in RCRA Sec. 3001 142 USC 69211 and a public hearing prior to receiving authorization to utilize the material. Once approved, existing NPDES permits required of the coal industry are modified to incorporate tight limits on discharges from areas receiving the materials. (MCC00051)

MCC has gone through the permitting and approval process in Maryland and currently uses fossil fuel combustion wastes as minefill and soil amendment. MCC places the material in direct contact with underground mine water in an attempt to utilize the materials high calcium content to increase the pH of our mine pool to a point where the pyrite oxidation reaction ceases. After 3 years of material placement and environmental monitoring, the utilization of approximately 400,000 tons of material has not shown any evidence of negative environmental impact. An overview of the project is included as Attachment A. (MCC00051)

## **VII. MINEFILL**

### **B. Appropriateness of Site-specific Evaluation and Control**

Industry, state and federal agency commenters noted that site-specific evaluation and control of minefill practices are necessary and desirable for managing risks from this practice. Further, several of these commenters argued that Subtitle C controls would preclude such site-specific considerations without providing environmental benefit. Public interest commenters did not dispute the site specific nature of this issue but noted that nationwide controls may be fashioned in a manner to take into consideration both current practices where deemed protective and site specific geochemical issues. A consultant for a public interest group commenter urged EPA to make a distinction between legitimate, engineered beneficial use (such as FBC waste used in pre-SMCRA mines) and unregulated, wholesale dumping.

Response: Much of the following has been noted in the above responses but is repeated here in specific acknowledgment of concerns as to appropriate regulation.

Based on its review of the extensive case study information submitted by commenters, EPA believes that many complexities related to site-specific geology, hydrology, waste chemistry and interactions with the surrounding matrix, as well as other relevant factors must be taken into account to evaluate whether minefilling can be done in a manner deemed to be sufficiently protective. Environmental impacts associated with minefilling will be highly site-specific. Therefore, the Agency agrees that controls on minefill projects should be designed based on site-specific evaluation. However, the complexity and variation in minefilling practices are compelling reasons to establish overall national regulations that will ensure consistent and thorough site-specific analysis that adequately takes all relevant factors into account. We intend to consider well known and accepted geochemical relationships in developing this approach.

The Agency agrees that flexibility is important and believes that such national regulations can be effectively structured to lay out the factors which must be taken into consideration. We agree with commenters who stated that such review is best done at the state level. The federal register notice announcing today's decision requests comments on alternative approaches to developing such a national regulation. Based on the comments we receive, we will develop a proposal for notice and comment so that all interested parties have the opportunity to comment on approaches to developing such a regulation.

While the approach that the Agency has chosen involves developing national standards for minefilling of coal combustion wastes, the intent is to be as flexible as minefilling conditions allow. States would be responsible for ensuring compliance with Subtitle D standards. EPA and state experience with revised Subtitle D standards specifically for municipal landfills is that they have allowed states flexibility while at the same time providing a clear structure that has resulted in significant improvements in environmental protection. As noted elsewhere in this document, in consultation with the Office of Surface Mining, we will also assess the authorities available under SMCRA to ensure protective and consistent minefilling practices across the country. We will rely on RCRA authorities, SMCRA authorities or a combination of both RCRA and SMCRA, based on an assessment of which can be used most effectively.

## **VII. MINEFILL**

### **B. Appropriateness of Site-Specific Evaluation and Control Verbatim Commenter Statements**

DOE concurs with EPA's stated consideration that "these (minefilling) operations, with their pre-existing concerns, may require very site-specific determinations that do not lend themselves to national standards." (DOE00020)

In providing such information, DOE believes it is important to point out the substantive differences in the practice of CCW minefilling as they pertain to surface and underground mines. For example, while "depth to ground water" is a very important factor that should be incorporated in any regulation for minefilling at surface mines, the term is ambiguous or irrelevant for underground minefilling situations, which may occur at depths that are hundreds of feet below any potable aquifer. Also, private industries are primarily responsible for ensuring the environmental performance of active mine sites, while public entities (usually State governments) are ultimately responsible for the environmental performance of abandoned mine sites. This is likely to affect the practical application of CCW minefilling, especially in situations where it may help correct existing environmental or safety problems at the mine sites. DOE believes that a more flexible regulatory approach than Subtitle C is needed to address these situations. (DOE00020)

DOE believes the use of comprehensive, site-specific empirical data is the most appropriate way in which to assess the human health and ecological risks associated with minefill projects. (DOE00020)

The removal of waste coal for use as FBC fuel, and the subsequent reclamation of the re-mined site with the resulting FBC ash, is an integrated process. This process requires site specific considerations and flexibility to maximize both the economic and the environmental benefits. (PG&E00023)

In case by case evaluations, supported by technical data and environmentally sound management, CCBs can be applied in many uses which are benign to the environment. (WRAG00030)

We believe that site-specific conditions merit individual review. This review should be conducted by local and state regulators rather than the Agency. (NCE00031)

In contrast to the body of mature research conducted by other institutions, EPA is at an initial stage of formulating the potential issues under consideration. Significantly, EPA has not established that mine placement of CCPs presents a problem. Furthermore, EPA acknowledged that, should a problem be established, the resolution "may require very site-specific determinations that do not lend themselves to national standards." USWAG commends EPA for identifying this fundamental argument against federal regulation of mine placement of CCPs. (USWAG00037)

The establishment of RCRA Subtitle C would place all minefill operations under an umbrella of controls, requirements, and constraints that would not address site specific conditions. (VAP00042)

In addition, APS and USWAG are greatly supportive of the agencies acknowledgment that, if a problem exists, the resolution “may require very site- specific determinations that do not lend themselves to national standards.” The hydrogeology of each mine situation is complex and peculiar, and the state agencies are best equipped to deal with individual situations. (APSC00043)

Again, a region-specific approach is needed because of the varying geologic settings and especially because of the differing chemical, mineralogical, and physical properties of fossil fuel combustion (FFC) wastes. (EERC00044)

Ash in minefilling is another application that must be considered on a site-specific basis. (CIBO00052)

By contrast, IDNR believes regulation under Subtitle C would promote a “one-size fits all” approach that will discourage recycling of coal ash and thereby encourage the continued placement of coal ash in Indiana’s floodplain environments. We urge you to affirm that state regulatory authorities should continue to regulate placement of coal ash in mine sites under existing state programs. (IDNR00062)

PG&E is not talking about the universe of fossil fuel combustion products or its disposal. They are not talking wholesale disposal of coal combustion wastes by indiscriminate dumping of tens of millions of tons at single mines. They are not talking about disposal in mine sites that have had the benefit of toxic material handling plans required by the surface mining laws (SMCRA) to minimize damage related to mining. They are not talking about the full range of fossil fuel combustion wastes, with the full range of chemical and physical properties. (GHIL0012)

PG&E’s comment’s consider a legitimate, if overstated, application of a specific waste type for a specific beneficial used in a specific setting. The specificity (and limits) of these applications is lost in the rhetoric. The comments create the impression that CCW wastes in general have these properties and that anything short of USEPA’s turning loose of regulation will prevent a tremendous landscape of beneficial application form being realized. It is important that the distinction between legitimate, engineered beneficial used and unregulated, wholesale dumping continually be drawn and emphasized. (GHIL0012)

## **VII. MINEFILL**

### **C. Adequacy of Existing Regulations**

Many commenters addressed the adequacy of existing regulations to address risks associated with minefilling. Supporters of the practice pointed out that federal controls (SMCRA, NPDES), state programs, and other standards (e.g., ASTM) adequately address site-specific problems, and that additional federal involvement might limit state flexibility and effectiveness without minimizing risks and might delay further development of state programs. Some commenters offered individual states' programs (e.g. Pennsylvania) as examples of effective programs. One commenter provided a study by the Department of Interior's Office of Surface Mining in support of its contention about the adequacy of Indiana's program.

Some citizen and public interest group commenters reported that industry practices are not protective, that SMCRA enforcement is lax, and that many state programs do not effectively enforce SMCRA provisions and/or do not include enforceable standards. One of the commenters further stated that EPA should defer regulations only in states where the Agency has specifically found regulations to be adequate. Many of the commenters stated that failure of EPA to regulate minefilling would encourage states to continue with weak regulatory programs. Another commenter stated that state programs effectively allow open dumps without any design or construction standards and few operational requirements. The commenter offered an individual state program (Indiana) as an example of an inadequate regulation. The commenter further stated that programs in Illinois and Kentucky also do not provide for adequate characterization of aquifers and do not require adequate long term monitoring. A number of other commenters similarly expressed concerns about the effectiveness of Indiana's program. One public interest group commenter provided information on minefilling regulations in Germany as a model for EPA.

Response: The summary table "State Regulation of Mine Placement of Coal Combustion Wastes" in the docket documents the Agency's review of the extensive information on state minefill regulatory programs. The Agency concludes that many states where this practice is occurring do not have protective programs in place. We find gaps such as a lack of adequate controls and lack of restrictions on unsound practices, e.g., no requirement for ground-water monitoring and no geochemically-based control or prohibition of waste placement in the aquifer. As noted above, the Agency will develop future regulations to have minimal effect on those states that are effectively overseeing minefilling operations to ensure protection of human health and the environment. We will consult with all stakeholders as we develop the regulations.

In response to commenters who cited the Department of Interior's Office of Surface Mining (OSM) and their responsibilities under the Surface Mine Control and Reclamation Act (SMCRA), we recognize that under SMCRA, OSM has broad authority to ensure proper reclamation of surface mines. Other commenters have noted alleged weaknesses in the SMCRA. While we have not conducted a comprehensive review of existing SMCRA authorities or implementation of those authorities by OSM and authorized states, EPA is committed to ensuring that any necessary improvements are made in the management of these wastes under the appropriate legal authorities. Specifically, EPA will work closely with OSM in developing subtitle D regulations (and, as noted elsewhere, may pursue with OSM revision to OSM regulations) to ensure that minefill activities are adequately addressed."





**VII. MINEFILL**  
**C. Adequacy of Existing Regulations**  
**Verbatim Commenter Statements**

State EPA's typically regulate the mine placement applications with oversight and advice from the state's department of natural resources or mines. Such a regulatory arrangement is prudent as well as economical. (OSU00015)

For these reasons, OCDO firmly believes that existing state regulatory bodies are in the best position to review and regulate local uses of CCPs. (ODOD00017)

Practices are currently subject to industry best management practices and state regulatory controls that are effective. (IEU000018)

With respect to mine placement of CCP in Indiana, the Department of Natural Resources has full Surface Mining Conservation and Reclamation Act (SMCRA) authority. (IEU00018)

Since 1992, Indiana has operated under a policy memorandum governing the use of CCP as minefill. In 1998, formal rules were proposed and preliminarily adopted by the Indiana Natural Resources Commission in November of 1998. Final approval of these rules is expected in late 1999 but will be held in abeyance until the EPA Bevil Phase II regulatory determination is completed. (IEU00018)

ARIPPA believes that there is an adequate regulatory framework in existence in the States to insure the proper management of coal combustion wastes. The States have developed their programs to meet the unique aspects of their States. In addition, the States also have developed coal mining programs that meet the requirements of the federal Surface Mining Control and Reclamation Act, which requires the States to evaluate the impact of mining and reclamation on the environment, including the hydrologic balance and the ability to revegetate the mine land. (ARIPPA00019)

States have developed coal mining permit programs that meet the requirements of the federal Surface Mining Control and Reclamation Act, which requires the States to evaluate the environmental impacts of not only mining, but reclamation, including the hydrologic balance and the ability to revegetate the mine land.

The majority of the beneficial uses of FBC ash addressed by EPA's Report were related to mine reclamation. As a matter of state and federal mining law, such reclamation must be approved as part of a mining permit issued pursuant to the federal Surface Mining Control and Reclamation Act. (ARIPPA00019)

Pennsylvania has a comprehensive environmental program that has been developed and implemented under which coal combustion wastes are regulated and managed. (ARIPPA00019)

Pennsylvania's environmental regulatory programs, including its coal mining regulatory programs (which have received delegation of primacy under the federal Surface Mining Control and Reclamation Program), and the implementation of its other comprehensive environmental regulatory programs provide the necessary regulatory framework to adequately control the management of coal combustion wastes in minefill and mine reclamation programs. (ARIPPA00019)

DOE believes that environmental protection concerns with respect to minefilling of CCW at active surface mines are best addressed at the State level. (DOE00020)

As with active surface mines, the minefilling of CCW in active underground mines is likely to be overseen by one or more State agencies. These agencies typically require the chemical properties of the CCW materials to be characterized, and some type of environmental monitoring at the mine site to be conducted as part of the permit(s) associated with the underground mining operation. However, the hydrogeologic settings associated with underground mine operations are often far more complex than for surface mines and the monitoring program needed to adequately assess the environmental effects of underground minefilling will necessarily be very site-specific. The relative rarity of such applications suggests that State agencies should be able to address them successfully on a case-by-case basis. Therefore, DOE believes that the development of Subtitle C controls for minefilling of CCW in active underground mines would be unlikely to provide a higher level of protection of human health and the environment than existing regulatory mechanisms at the State level. If local concerns indicate that existing environmental protections with respect to minefilling of CCW at active underground mines need to be strengthened, these concerns are best addressed at the State level, within the agencies that are already responsible for ensuring the acceptable environmental performance of the active mining operation. (DOE00020)

A review of selected state regulations indicates that satisfactory procedures have been implemented at the state level under the authority of Subtitle D of RCRA for environmentally safe and technically sound uses of CCPs in agricultural applications. (ACAA00022)

The regulatory approaches used by the several states selected for review demonstrate not only that agricultural applications of CCPs are satisfactorily regulated at the state level, but also that further regulation at the federal level is not needed. (ACAA00022)

It does not appear that EPA fully considered that minefilling and soil amendments at mine sites require site specific individual permits under Pennsylvania law. Much more significant, however, is that EPA apparently has not considered that significant regulatory controls are required and exercised by the states under the Federal Surface Mining Conservation and Reclamation Act. (PG&E00023)

EPA's discussion of existing state and regulatory controls focuses on waste regulations. It omits any discussion of the State and Federal Surface Mining Conservation and Reclamation Acts major regulatory program that particularly affects all mining relating uses. (PG&E00023)

While there are concerns that must be addressed in the utilization of CCPs at mine sites, those concerns are recognized and addressed by the existing state and federal regulatory regimes. (NMA00024)

States are adequately regulating the beneficial use and disposal of CCPs, including use for agricultural purposes and use and disposal in minefill. (NMA00024)

We believe that the data demonstrate that the use of ash does not result in groundwater degradation when used in accordance with the regulations and guidance in effect in Pennsylvania. This result is the same whether the ash placement is within or above the water table. (PADEP00025)

The IMCC supports the recommendations that the Subtitle C exemption be retained for these materials in minefill applications. We urge you to affirm that state regulatory authorities should continue to regulate placement of coal ash at minesites under existing state programs. We believe it is important that state-specific conditions are addressed to assure environmentally safe and effective ash handling, since this cannot be most effectively legislated on a broad national basis. (IMCC00027)

The existing state programs under SMCRA provide the necessary environmental safeguards to protect the hydrologic balance and the public. (IMC00027)

The WRAG would urge the Agency not to implement federal regulations under Subtitle C for agricultural or minefill applications of CCBs and believes that current local oversight adequately addresses the issues raised by the Agency. (WRAG00030)

We believe that site-specific conditions merit individual review. This review should be conducted by local and state regulators rather than the Agency. (NCE00031)

EPA regulatory guidance may not be flexible enough to permit state and local agencies to approve these applications when site-specific situations pose little or no threat to public health or the environment. (NCE00031)

It is our opinion that these engineered guidelines adequately address the use of CCBs in above ground minefills and therefore no additional guidance by the Agency is needed. Furthermore, ASTM is developing two new standards that call for the use of CCBs in minefill applications, both above ground and underground. When issued, these standards will likewise provide adequate environmental guidance for this use and minimize the need for any new regulations. (NCE00031)

In conclusion, New Century Energies strongly believes that sufficient guidance is available at the state and local level pertaining to applications of CCBs in agricultural and minefill applications. (NCE00031)

Overall, it is my opinion that the existing federal/state regulatory programs as described above do allow for, and in fact require, sufficient testing and appropriate management practices of coal fly ash and related CCPs when utilized in both mined land and agricultural environments. I do realize that state regulatory packages for CCPs vary, but all states must comply with SMCRA requirements for active surface mining permitted areas. (VAT00033)

State regulators are best equipped to respond to the site-specific issues of mine placement. (USWAG00037)

The fact that EPA has found no proven damage cases indicates that the combination of sound management practices and existing regulatory oversight has responsibly addressed any significant risks that might exist. (USWAG00037)

The lack of damage cases indicates that sound management practices and State regulations are adequate to insure protective placement of CCPs. To be sure, “[m]ost state regulations and practices favor placement of materials above the water table.” Nonetheless, the states recognize the complexity and diversity of potential mine placement projects, and in response, “most regulations allow for the consideration of placement in saturated settings, given appropriate hydrogeology and favorable results from leaching and characterization tests.” EERC cited the example of North Dakota’s standards for the use of fly ash-based flowable fill for abandoned underground mines in saturated settings. Wyoming allows the placement of bottom ash in saturated settings in the Black Thunder mine contingent on favorable leaching test results. Similarly, Illinois and Indiana allow placement at or below the water table dependent upon site-specific considerations. Pennsylvania regulations currently include restrictions on placement near the water table. However, it is significant to note the State is reconsidering that restriction based on the positive results of a demonstration project conducted by Penn State. (USWAG00037)

EPA should not interfere with the State programs without a clear demonstration that the existing state-based regulatory structure is inadequate to protect human health and the environment. To the contrary, the case studies cited above indicate that the environment has benefitted from these projects conducted under existing state regulatory authority. (USWAG00037)

States have the ability to develop effective landfill, mine reclamation, and agricultural programs. (ISG00048)

CIBO disagrees with any suggestion that national regulation should supplant or duplicate State regulation, for sound policy and practical reasons. Controls should be site- and application-specific, as ash reuse is already governed by State regulation, and not through Subtitle C comprehensive federal regulation. Nor does CIBO believe that a voluntary program is necessary; as already stated, States have their own regulatory programs governing the use of ash and its disposal in minefills. (CIBO00052)

Regulatory programs already exist which consider site-specific criteria for ash use in mine reclamation, and this should continue for proper control of this application. (CIBO00052)

Disposal of CCBPs in an active surface mine is regulated by two state agencies, the Texas Natural Resource Conservation Commission (TNRCC) and the Railroad Commission of Texas (RCT), with oversight from the U.S. Interior Department Office of Surface Mining Reclamation and Enforcement (OSMRE). (TXU00053)

By contrast, IDNR believes regulation under Subtitle C would promote a “one-size fits all” approach that will discourage recycling of coal ash and thereby encourage the continued placement of coal ash in Indiana’s floodplain environments. We urge you to affirm that state regulatory authorities should continue to regulate placement of coal ash in mine sites under existing state programs. (IDNR00062)

In both cases, I believe EPA should look to the states for regulatory oversight of these activities, and, in fact, many states already have robust regulatory programs tailored to their local circumstances. (BCHRL0002)

In addition, state regulatory programs are demonstrably more than adequate to address any risks posed by the use and disposal of CCPs; the states have clearly recognized how beneficial the various uses including agricultural and minefill uses - can be. (WVDEPL0003)

The ACAA and PP&L believe the beneficial use of coal ash as minefill is being effectively managed in Pennsylvania under existing regulatory mechanisms and that Federal controls are unnecessary and may even thwart these beneficial initiatives. (PHS013)

The ACAA and PP&L believe that minefill should be left to the states to regulate, based on state-specific needs and priorities. (PHS013)

The data demonstrates that the use of ash does not result in groundwater degradation when used in accordance with the regulations and guidance in effect in Pennsylvania. In many cases, the use of ash resulted in a significant improvement of water quality. (PADEP00246)

EPA has done much in recent years to eliminate conflictive and inconsistent regulations which reduced program effectiveness and impeded environmental improvements. The agency also has voiced its willingness to let states manage environmental programs where such management is both protective and effective. I submit that action by EPA to apply RCRA regulation to the beneficial use of waste coal ash in mine reclamation would directly contravene these policy objectives. (PA00247)

The Pennsylvania Department of Environmental Protection (DEP) comprehensively regulates use of the ash in reclamation and soil amendments; and no adverse impacts have been discovered despite a decade of monitoring. (EPACAMR00248)

On behalf of the Eastern PA Coalition for Abandoned Mine Reclamation (EPCAMR), we believe that PA has ample and effective waste disposal and arrangement regulations already in place. (EPACAMR00248)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (PCLP00249)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (G&L00252)

I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (G&L00252)

Pennsylvania's Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (PA00253)

As the Sub-Committee Chairman on Mining of the Environmental Resources and Energy Committee, I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (PA00253)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (CIN00254)

As the operator of the Westwood Generating Station and a member of ARIPPA, I believe that Pennsylvania has ample and effective waste disposal and management regulations all ready in place. (CIN00254)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (EPC00255)

As the Plant Manager of Ebensburg Power Company, I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (EPC00255)

These are the very same principles midwestern mines have used since the inception of the Surface Coal Mining Reclamation Act to dispose of acid-producing and toxic forming mine waste and spoil materials in the mining pits below the water table to meet the Act's requirement to prevent or minimize potential acid or toxic mine drainage. This method of disposal has proven successful over the past twenty years in eliminating or reducing harmful mine drainage which occurred at surface coal mines prior to implementation of SMCRA. Disposal of these coal mine wastes would not be possible otherwise. The same is true for disposal of coal ash at surface coal mines. (ICC00269)

Air Products and Chemicals, Inc. believes that both California and Pennsylvania have ample and effective environmental management programs applicable to the use of CFB ash. (AIRP00270)

The beneficial use of ash for mine reclamation is regulated in Pennsylvania by PaDEP. Under PaDEP permits, the ash must be tested prior to placement, and the groundwater must be monitored at the ash placement site. The data demonstrates that (1) the concentrations of arsenic and other metals in the ash are lower than the TCLP standards, and in many or most cases are within the range of concentrations in the surrounding native soils; (2) arsenic and other metals leach from the ash at a far lower rate than native soils; and (3) the groundwater at the sites generally shows either no change or an improvement to background conditions. (ARIPPA00273)

PaDEP's comments to EPA noted that data from the nearly 100 mine sites throughout Pennsylvania where ash has been used as a supplement for soils or minefill demonstrate that "the use of ash does not result in groundwater degradation when used in accordance with the regulations and guidance

in effect in Pennsylvania.” The three volumes of supporting data submitted by PaDEP provide ample data to support PaDEP’s conclusions. (ARIPPA00273)

The docket is replete with descriptions of states regulatory programs that have evolved to monitor environmental effects of coal ash use. Moreover, the mining uses are comprehensively regulated by EPA’s sister agency, the Office of Surface Mining. PG&E Gen believes that EPA regulation would be duplicative and burdensome, without corresponding public benefit. (PG&E00274)

There is no discussion in the Report and little in the docket regarding the significant regulatory role of the Office of Surface Mining in administering the Surface Mining Conservation and Reclamation Act, which creates preemptive federal authority over the regulation of all surface mining activities. As noted in our initial comments, surface mining activities under the act specifically include mining reclamation. Environmental protection, particularly from impacts upon water resources was a principal reason for the adoption of the federal mining laws, and prevention and minimization of water pollution from mining is a primary purpose of the regulatory program administered by OSM. (PG&E00274)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (FW00277)

As Plant Manager of the Foster Wheeler Mt Cannel facility, I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (FW00277)

OSM shares EPA’s concerns regarding the potential for contamination of groundwater and surface pathways from the use of some CCBs in mine reclamation. We believe that is possible that certain CCBs and associated materials may exhibit hazardous characteristics or pose unacceptable risks in some situations. However, we know of many examples where CCBs have been an integral part of successful reclamation under both Title IV and Title V. There is an extensive inventory of completed projects, and there are a number of ongoing projects in various stages of completion. As the EPA states in its report, the environmental benefits achieved through this reclamation have been extensive. In all of these projects, OSM and the States have ensured that tie potential environmental and health and safety impacts of CCBs were evaluated. The enclosed copies of papers on successful reclamation were presented at national AML meetings highlighting the use of CCBs. (OSM00283)

The Pennsylvania Department of Environmental Protection has monitored these sites and concluded that the application of coal ash in accordance with state requirements does not degrade water resources. In some cases, the use of the coal ash has actually improved the water quality. (PA00293)

At this time, the EPA should not be hindering their efforts with burdensome and unnecessary regulations. (PA00293)

As a member of the House Environmental Resources and Energy Committee, I believe that Pennsylvania already has effective management and beneficial use regulations in place for this use. (PA00296)



As the General Manager of a waste coal -fueled electric generation station, the Gilberton Power Company, I believe that we have amply and effectively demonstrated the successful balance between economic issues and environmental concerns through adherence to the Pennsylvania regulations for CFB ash disposal and beneficial use and can see no benefit to the expansion of RCRA to include waste coal CFB ash and mixtures of coal ash with other fuel ash produced in a CFB. (GPC00297)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (KCC00298)

As Vem Kerry, President of Kerry Coal Company, Inc., I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (KCC00298)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (SMC00299)

As Vern Kerry, President of Shamrock Minerals Corporation, I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (SMC00299)

As a State Senator, I believe that PA has ample and effective waste disposal and management regulations already in place. (PA00300)

The Pennsylvania Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments with no discovered adverse impact over a decade of monitoring. (PA00301)

I believe that Pennsylvania has ample and effective waste disposal and management regulations in place. (PA00301)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (PA00302)

I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (PA00302)

While the EPA teeters over this decision, the Pennsylvania Department of Environmental Protection (DEP) has, for over a decade, comprehensively overseen and regulated the use of ash in reclamation and soil amendments, monitoring and testing the use of ash and finding no adverse effects or impacts during this time period. (PA00305)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (ACV00307)

As President of ACV Power Corporation. I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (ACV00307)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (TEGI00308)

As a Plant Manager and local resident I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (TEGI00308)

As a member of the Pennsylvania House of Representatives, I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (PA00368)

The PA State Department of Environment of Protection (DEP) comprehensively regulates the use of ash in reclamation and as soil amendments with no adverse impacts despite a decade of monitoring. (AMI00372)

As President and Owner of Amerikohl Mining, Inc., I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (AMI00372)

We believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (PAL0001)

The beneficial use of ash for mine reclamation is regulated extensively in Pennsylvania by the Department of Environmental Protection (DEP). Under DEP permits, the ash must be tested prior to placement, and the groundwater at the reclamation sites generally shows either no change or an improvement, often significant, to background contamination in over a decade of monitoring ash samples and downgradient waster. (PMRABL0003)

The beneficial use of ash for mine reclamation is regulated extensively in Pennsylvania by the Department of Environmental Protection ("PaDEP"). Under PaDEP permits, the ash must be tested prior to placement, and the groundwater must be monitored at the ash placement site. The data demonstrates that the groundwater at the reclamation sites generally shows either no change or an improvement, often significant, to background conditons. The use of ash for mine reclamation has not resulted in groundwater contamination in over a decade of monitoring ash samples and downgradient waster. (PCCL0007)

The application of CFB ash in this reclamation work is regulated by federal and state agencies under the Surface Mining Conservation and Reclamation Act of 1977 (SMCRA). I believe that this act and the monitoring requirements undertaken through its administration by state agencies are effective in the long term management of CFB ash in mine reclamation uses. (LRCAXXXX)

In addition, the Office of Surface Mining (OSM), Indianapolis Field Office, conducted a study in 1997 to determine whether the Indiana Division of Reclamation was properly administering its surface mining program responsibilities by requiring all operators to develop effective handling, disposal, and monitoring plans to ensure the protection of the hydrologic balance. After reviewing

all thirteen mine permits that allowed the placement of CCP at mine sites, the OSM study concluded that Indiana was properly administering the mine placement of CCP. (IEU00018)

Attached as Appendices B and C to these comments are the German laws (in German and English) that regulate minefilling of wastes, including coal-combustion wastes. We present this material as a model for EPA in considering whether and how to regulate the minefilling of the range of co-managed FFC wastes. (ALA00292)

One defining feature of mine dumping practices can be their size and scale. For example, in two years the Indiana Department of Natural Resources (IDNR) granted permits to fourteen active strip mines with coal combustion waste disposal plans that explicitly authorized as much disposal capacity (100 million tons) as the entire annual generation of CCW in the nation. (HEC00056)

Note that, there is no claimed acid neutralization benefit purported in any of these minefill permits. The pH of spoil waters in these mines is typically neutral to alkaline. There is also no contouring, revegetation, or reduced infiltration to mine workings being undertaken with CCW in these permits. (HEC00056)

Other features that are often the case with minefills include the lack of good characterization of potentially affected ground water systems, the lack of leachate collection, the dumping of wastes directly into ground water, very little ground water monitoring, typically no long term ground water monitoring and little if any corrective action standards or requirements. (HEC00056)

There is little if any aquifer specific information in Indiana's strip mining permits. The state does not require that different aquifers be sampled individually for quality, or that bail tests or pump tests be performed on aquifers individually to determine their permeability, rate of flow or connections with other aquifers. (HEC00056)

Indiana's current minefill practices and its proposed minefill rule allow ash that leaches metals and other constituents well beyond what is detrimental to human health, other life or uses of water, to be dumped into mines without any steps to prevent or minimize contact of that ash with ground water. (HEC00056)

We have seen minefilling operations in Illinois and Kentucky under permits that have not defined the ground water systems well enough to effectively protect them. (HEC00056)

Nonetheless there are fundamental differences in how RCRA's solid waste requirements and the requirements of SMCRA are being applied to protect the environment from CCW in this case. One major difference is in the test used to characterize the CCW. We have insisted that for any leachate test to indicate whether a CCW is toxic forming, it must be designed to simulate the leachate likely to form from CCW in the mine environment. This is crucial because unlike the requirements in Indiana's solid waste landfill rules (modeled under RCRA Subtitle D guidelines), IDNR has steadfastly refused to support any engineered containment in its minefilling rule that would separate the waste from ground water in a mine. Thus the only safeguard that the proposed rule will use to prevent contact between ground water and ash that is toxic forming will be the results of the rule's leachate test. Unfortunately, it appears that IDNR and the electric utilities do not want to use a test that can competently forwarn of environmental risk, perhaps because it might

necessitate a few safeguards. Their minefilling rule will utilize the ASTM D-3987-85 leach test with distilled water. (HEC00056)

Indiana is permitting mining operations today that are several thousand acres and larger with only a few (5 to 10) monitoring wells. Subsection 310 IAC 12-5. 161(b) of its proposed rule will require no monitoring wells around backfilled CCW areas other than those monitoring wells already required by the mining operation. (HEC00056)

In addition, 310 IAC 12-5-161(c) confines placement of monitoring wells around monofills to "unmined strata no more than 300 feet from the coal extraction area." This allows down-gradient wells to be placed many hundreds if not thousands of feet from the monofills. (HEC00056)

Indiana's proposed monitoring systems are far less adequate than those requiring wells to be within 250 feet of a CCW disposal site in a Kentucky strip mine (see 401 KAR 45:160), at the closest practical point from CCW disposal site in an Ohio strip mine (see OAC 3745-30-08) and within 25 feet of a disposal site in an Illinois strip mine (see IL Ground Water Protection Act and Environmental Protection Act and 35 IAC 620). (HEC00056)

The first area concerns the fact that minefill permits are being issued without any ground water standards that would trigger corrective actions if exceeded. (HEC00056)

Related to this concern is the fact that Indiana and other states engaged in minefilling such as Illinois and Kentucky are not extending the period for holding reclamation bonds at mines that have become CCW dumps. In many of these situations, the mines are dewatered sites drawing ground water inward from all directions in large cones of depression. In such scenarios involving large mines with slow recharge rates, long resaturation periods means that monitoring wells may be pulled out of the ground long before they could measure the quality of waters leaving CCW disposal sites. (HEC00056)

From 1982 till 1993, I worked with Save Our Cumberland Mountains (SOCM) in Tennessee and spent a lot of time tracking the federal Office of Surface Mining's (OSM) very poor enforcement of any protections against impacts to groundwater resources. (NPCA00259)

I think relying on the strip mining industry to police itself is not a good course of action. (CITZ00262)

At the current time, Indiana is considering a state rule that will allow dumping of millions of tons of CCW into unlined strip mines in direct contact with groundwater. (CITZ00265)

Unfortunately, mining firms and government regulatory agencies are allowing utilities to dump toxic CCW in mine pits. (CITZ00271)

Many coal field states have begun the practice of dumping CCW into unlined strip mines in direct contact with groundwater. In addition to the numerous problems coal field residents already face, many now have to deal with the dumping of millions of tons of toxic forming solid waste directly into the very aquifers that feed their wells. (SIERRA00278)

EPA's present report should state clearly to Congress that SMCRA regulations do not allow, or have in place, that surface coal mining operations' procedures for reclamation sites be used at waste disposal sites. Any effort to change current reclamation rules and regulations will take years in Congress, under the rules of the Office of Surface Mining Reclamation and Enforcement, and create an unfunded mandate by EPA. A National Ban on CCW waste disposal is a better way to address the problem in the long run. (SOCM00279)

Many states have begun allowing the dumping of CCW into unlined strip mines in direct contact with groundwater. In addition to the serious problems coal field residents already face, many now have to deal with the dumping of millions of tons of toxic forming solid waste directly into the very aquifers that supply their wells. (CITZ00284)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00285)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00286)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00287)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00289)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00290)

In Indiana, where disposal sites need not be located and recorded, this opens the possibility of health issues not related to water quality should residential sites be located in abandoned coal fields. Again, additional data exploring all aspects of this issue need to be further examined. (PURD00294)

Our state has furthermore embarked on a disastrous path in that our Governor is welcoming the millions of tons more of east coast harbor and river muds and sediments. Once more, under the mixed rule -- these are 'blended' with more incinerator ash -- sky high in lead, cadmium and other dangerous materials -- and brought into our state to spread on strip-mined land. EPA's own National Sediments Survey called these muds Priority One -- most likely to be heavily

contaminated with DDT, mercury, PCBs. Yet thanks to the weak and getting weaker regulations on coal combustion wastes -- all this additional polluted material is heralded as magically 'beneficial.' (PEACE00306)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00311)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00312)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00313)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00314)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00316)

I am concerned about the proposed state rule in Indiana which would allow for the dumping of Coal Combustion Wastes (CCW) into the strip coal mines here in southwestern Indiana with direct contact with ground water. (CITZ00317)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00318)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00318)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00319)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions

of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00319)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00320)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00320)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00321)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00321)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00322)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00322)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00323)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00323)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00324)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00324)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00325)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00325)

Indiana is currently considering a state rule that will allow millions of tons of coal combustion waste to be dumped into direct contact with ground water. (CITZ00327)

Indiana is too lax in control of protecting our drinking water, as well as irrigation water. (CITZ00329)

Indiana, noted for its lax environmental regulations, is considering allowing millions of tons of CCW to be dumped into unlined stripe mines in direct contact with ground water. (CITZ00330)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00331)

Mining can have profound effects on the quality and quantity of water in ground water systems. Mining regulators often have little appreciation for impacts on ground water resources. (HEC00332)

Apparently, EPA would like to rely on state regulatory agencies to properly and fully regulate CCW dumping in mines and on the utility and mining industry to do thorough analyses and present complete data and plans. It doesn't work that way. (HEC00332)

In all five [mine reclamation permits], almost identical boiler plate language was used to describe the geologic conditions, the geochemistry of sites and effects on groundwater after mining. None contained the detailed site-specific analysis required before a responsible determination can be made of the existence and integrity of the clay layer to prevent downward migration of water. Not one contained any analysis -- much less acknowledgment -- that water moves sideways and downgradient. (HEC00332)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater. (NCSEA00334)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00336)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact without concern for the consequences. (CITZ00336)



In addition, counties should be forced to take upon the responsibility of running water lines to all citizens who live in less populated areas giving them the access of clean drinking water instead of relying on ground water which is being threatened by CCW. (CITZ00336)

Toward the end of these discussions, I realized that-the fix was in. The polluters -primarily Indiana-electric power utilities and various coal companies around the state - had coerced state officials to draft rules that were much more lenient than our neighboring states of Ohio, Illinois and Kentucky. (CITZ00338)

At the present time, it seems we cannot rely on the O'Bannon administration or local elected officials to do anything to protect the public interest in this regard. (CITZ00338)

RCRA Subtitle C requirements for hazardous wastes should be applied to the practice of dumping CCW in strip mines. If this step is not implemented, it will give this state's Department of Natural Resources and the Natural Resources Council the green light to continue to move toward turning the Southwestern corner of this state into the industrial-dumping ground for the region's power companies. (CITZ00338)

I am writing to request that the EPA enact federal regulations that will prevent coal combustion waste (CCW) from contaminating the water supply in the state of Indiana and, indeed, the United States of America. It is my understanding that a state rule is under consideration in Indiana that will permit millions of tons of CCW to be dumped into unlined stripmines in direct contact with groundwater. I believe that if this is allowed then the contamination of groundwater in these areas is only a matter of time. (CITZ00339)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00340)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00340)

Indiana has no legislation to prohibit combustion ash and all of its heavy metals from being re-buried in mines in Indiana. In fact, I understand that the industry promotes this dumping as a practice. Since there are no "lime" requirements in Indiana our potable water supply may be at risk. (CITZ00341)

The other Midwestern states that are high coal-burners for power plants have been able to come up with hazardous waste laws governing this matter. To data I understand the overseers - **[name not legible]** / Water Quality personnel for our Department of Natural Resources State Department - have succumbed to corporate pressures to encourage refilling coal mines in his area with coal ash. (CITZ00341)

I am convinced that open dumping of CCW that has no restrictions on it is poisoning my drinking water. (CITZ00342)

Indiana is currently considering a state rule that will allow millions of tons of CCW to be dumped into unlined strip mines in direct contact with ground water. (CITZ00343)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00343)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle c requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00344)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00345)

Unfortunately, mining firms and government regulatory agencies are allowing utilities to dump toxic CCW in mine pits. (CITZ00347)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00348)

The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00350)

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The practice of dumping CCW in strip mines should be regulated under RCRA Subtitle C requirements for hazardous wastes. To do any less will give states a green light to dump millions of tons of CCW into direct contact with groundwater without concern for the consequences. (CITZ00357)

Many coal field states have begun the practice of dumping CCW into unlined strip mines in direct contact with granddaughter. (POW00369)

We have noticed that many permits applications in Indiana for the original coal mine operations list as a benefit that the excavation will break up the water bearing strata so that the resulting basin can serve as a source of potable water after the mine is reclaimed and the basin fills up with ground water. Later a permit modification is filed to allow for the disposal of the CCW and then the previously mentioned benefit is dropped and the claim is made that there is not enough water to backfill the waste. The fact that the Indiana Division of Reclamation accepts this permit shell game is a good indicator of why EPA needs to provide adequate guidance through this report. (POW00369)

I am concerned about the new plans to dispose of 125 million tons of coal combustion waste in unlined Indiana mines. Fourteen permits have been issued. They include no safeguards to protect nearby aquifers. Two dumps near Michigan City, have been tested and one was found to have 100 times the safe level of arsenic. The other has 21 times the safe level of lead. These permits were approved in contradiction to stated department policy and federal laws governing the use of mines. (CITZL0011)

Many coal field states have begun the practice of dumping CCW into unlined strip mines in direct contact with ground water. In West Virginia this grossly compounds problems we already face from the coal industry. (CITZL0013)

You will also find an editorial from the Terre Haute Tribune-Star which criticizes the Indiana CCW mine disposal rule as being too weak to adequately protect groundwater resources. This sentiment has been echoed in editorials in the Indianapolis Star, Bloomington Herald-Times, Evansville Courier and Sullivan Daily Times that have official positions against the state rule in

its current form for failing to provide read protection of groundwater resources. Thus every major newspaper in Indiana's coal-field region has come out against the rule and the Indianapolis Star, Evansville Courier, and Bloomington Herald Times have each editorialized twice calling for more protective regulation. (HECL0014)

I think relying on the strip mining industry to police itself is letting the fox into the henhouse. Allowing coal combustion wastes to be returned to former strip mines is adding insult to the injury they've already done to the land. These wastes seeping into the ground water and possible commingling other industrial wastes with them is an unacceptable answer. (CITZL0015)

Additionally, MCC feels that the materials discussed in the March 1999 Document are properly and duly regulated at the State level. Any attempt to impose Federal restrictions over and above what the States already impose is inappropriate and an ill-advised attempt to implement a "one size fits all" regulatory approach to materials that are as varied as the sources producing them. (MCC00051)

## **VII. MINEFILL**

### **D. Benefits of Minefilling**

Some industry, academic, state government, and federal agency commenters stated that minefilling typically has no adverse environmental impact. Other commenters further articulated a wide range of benefits associated with minefill projects ranging including avoided greenfield development for disposal areas, mineland subsidence control and acid mine drainage controls. A few commenters claimed that minefills may be preferable to other disposal practices and hence minimize environmental release of FFC waste constituents. Other commenters suggested that FFC wastes are similar or superior to other natural materials (e.g., soils) used in minefilling.

One federal government commenter shared EPA's concern about the potential risks of minefilling in some cases, but stated that, in many examples, the projects provided substantial environmental benefits. Public interest group commenters similarly stated that minefilling may be appropriate in some instances and inappropriate in others. An academic commenter stated that, while returning CCW to underground coal mines has fundamental merit as landfills become more scarce, EPA should study the toxicity and environmental impacts of these projects more closely before reaching a decision.

In general, public interest group and citizen commenters expressed concern that minefilling poses a threat to human health and the environment. The commenters characterized minefills as open dumps that are used to avoid landfill disposal costs, not provide environmental benefits. Two commenters stated that the presumption of idealized circumstances for disposal at coal mines is a myth due to the complex fractured hydrogeology of mine sites. One of these commenters stated that, under Indiana's regulatory program, minefilling of large volumes is authorized with no claimed acid neutralization benefit and no plan for contouring, revegetation, or reduced infiltration. The commenter also stated that, contrary to the claims of minefill supporters, fire clay allegedly underlying sites does not provide a natural liner; neutralization of acid mine drainage is not always adequately planned or achieved by FFC waste (or necessary in the first place), and contamination from disposal of CCW can substantially worsen even ground-water quality that has already been degraded by mining.

Another commenter stated that some of the claims made by minefill supporters are exaggerated. Specifically, the commenter stated that, while FFC wastes can improve environmental problems caused by abandoned mines, they still result in degraded groundwater conditions. Furthermore, the solutions created by FFC wastes often are not permanent. The other public interest group commenter stated CCW is not needed for mine site contouring and the presumed benefit of avoiding greenfield development is absurd.. The commenter also stated that failure to regulate minefilling on a national basis would expose the industry to an open-ended web of liability.

Response: We believe that the use of coal combustion wastes to remediate mine lands can, depending on the site specific hydrological and geochemical conditions, improve conditions caused by mining activities. We also recognize that this often is the lowest cost option for conducting these remediation activities. We generally encourage the practice of remediating mine lands with coal combustion wastes when minefilling is conducted properly and when there is adequate oversight of remediation activities. We continue to be concerned about certain aspects of

minefilling and about a general lack of information that would enable us to assess the current state of this practice with more certainty.

At this time, we cannot reach definitive conclusions about the adequacy of minefilling practices employed currently in the United States and the ability of government oversight agencies to ensure that human health and the environment are being adequately protected. For example, it is often difficult to determine if existing groundwater quality has been impacted by previous mining operations or as a result of releases of hazardous constituents from the coal combustion wastes used in the minefilling applications. Additionally, information submitted during the public comment period cautions that if the chemistry of the mine relative to the chemistry of the coal combustion wastes is not properly taken into account, the addition of coal combustion wastes can lead to an increase in hazardous metals released into the environment.

**VII. MINEFILL**  
**D. Benefits of Minefilling**  
**Verbatim Commenter Statements**

The following benefits have been identified:

- The alkalinity of CCP mitigate the negative environmental impacts caused by acid mine drainage.
- CCP are similar in composition to the natural materials found at mine sites and are therefore readily acclimated into the subsurface environment through adsorption, attenuation, dispersion, and dilution processes.
- The post-mining environment is disturbed by the coal extraction process. By utilizing CCP for minefill, the need for additional, undisturbed green field areas for CCP storage can be reduced.
- The use of CCP as minefill will minimize the need for borrow materials required for mine reclamation activities performed pursuant to Surface Mining Control and Reclamation Act regulations. (IEU00018)

The data analyzed to date indicate that the placement of CCW in surface mines may contribute to the control of acid formation, and that trace element concentrations are not significantly elevated at down gradient sampling points. (DOE00020)

Many FBC boilers burn coal refuse economically; the haulback of the FBC ash to the mine site is often looked upon very favorably by the State because the FBC ash generally contains far fewer contaminants than the coal refuse, and often contains significant amounts of free lime, which helps neutralize acid-forming materials that are commonly found in the coal refuse. Regrading of unstable slopes and establishment of vegetation and erosion controls at the coal refuse site also occurs as a natural consequence of the minefilling operation. The operation is thus viewed by the State as a means of achieving environmental remediation at no cost to the taxpayer. (DOE00020)

While acknowledging that CCPs can contain trace elements of metals, the WVU researchers, based on monitoring of soils and plants, concluded that the trace elements in plants were not present “at levels toxic to animals or humans”. Overall, their conclusion was that “there are very limited chances of food chain contamination by use of coal ash” and “that it is safer to use coal ash on mine soil than to dispose of it in landfills.” Id. (NMA00024)

Thus, the data does not support EPA’s concern for disposal below the water table (a condition that eventually exists many years later at every disposal site in Indiana after the mined area has hydrologically recharged). Moreover, based on Dr. Banaszak’s comments, disposal below the water is probably preferred, due to the attenuative capacity of mine spoils, particularly for arsenic. (NMA00024)

Other members have found that CCBs can be used safely in lieu of virgin materials in mine backfill, as grout in mine injection projects and to remediate acid mine drainage situations. These applications reduce the need for new landfill space and permit recycling of a material that substitutes successfully for other materials. (WRAG00030)

Mine placement is generally a beneficial and environmentally protective use of CCPs. (USWAG00037)

Mine placement is a desirable and proven means to address some mine reclamation problems without additional environmental impacts. (USWAG00037)

In fact, CCP mine placement is often the only cost-effective way of dealing with some of the existing problems and can result in a net reduction in contaminant loading. (USWAG00037)

CCPs have been used effectively to provide the following benefits, among others, to mined environments:

- as a grout to stabilize underground mined areas, fill voids and reclaim land lost to productive use;
  - as a fill material to return surface mined areas to grade, control acid mine drainage, and condition soils;
  - as a topical soil amendment to improve soil chemical and physical properties to recultivate mine area soils;
  - as a capping material;
  - to neutralize pooled underground acidic mine waters;
  - to prevent further acidification of mine waters; and
  - to reduce oxidation of pyrites present in coal refuse and coal cleaning residues.
- (USWAG00037)

Thus, the disposal of coal ash in surface coal mine pits is distinctly different from the typical utility or industrial site where the coal ash is placed in fills or impoundments above ground (often in floodplains where extensive surficial aquifers may be present). The so-called “groundwater” present in the mined has already been highly mineralized by the disturbance caused by mining. Moreover, certain constituents with high attenuative capacity are present in the mine spoil to a much greater degree than in typical surficial soils present at other disposal sites. Additionally, these attenuative constituents are present in large quantities in surface mined areas due to the large amounts of overburden which must be removed to extract the coal. Finally, the confinement of the mine spoil water during recharge and the length of time to complete this process ensures maximization of dilution and attenuation processes to reduce the already minimal concentrations of coal ash leachate constituents. (ICC00269)

The chief environmental benefits of the Anthracite region’s [waste coal plants] are 1) removal of the coal-refuse banks and silt ponds and 2) reclamation of strip-mined lands through disposal, compaction, and grading of alkaline ash from the fluidized bed boilers. The nine facilities discussed here have already consumed many millions of tons of anthracite “culm” and silt, and it is likely in the 40-year useful life of the plants as much as 250 million tons could be ultimately removed from the landscape. As to filling-in of the old strip mines -- in 53.0 plant-years of operation the nine plants have so far generated a volume of ash sufficient to reclaim about 250 acres of strip-mined lands. This suggests that in the 360 plant-years of operation projected for these facilities, they will produce enough ash to reclaim nearly 1700 acres. (ARIPPA00273)

Another significant and beneficial environmental impact of the [waste coal] facilities arises from the fact that several of them neutralize and demineralize acid waters from the underground mine



pools for use as cooling-tower make-up, boiler-feed make-up, and ash-moisture control. This results in the removal of contaminated mine-water that could otherwise ultimately find its way to surface outflows. In addition, recent analyses of the mine pool utilized by the Wheelabrator Frackville Cogeneration plant indicate a marked decrease in the overall iron content since start-up. (ARIPPA00273)

Through 1998, Pennsylvania's 14 waste coal plants collectively have removed over 56 million tons of coal refuse from Pennsylvania's landscape, and have used the 37 million tons of resulting alkaline ash to reclaim nearly 2,300 acres of abandoned surface mines. Appendix II. Nearly all of the ash generated by Pennsylvania's waste coal plants is beneficially used for mine reclamation. The 2,300 acres of abandoned surface mines were reclaimed at no cost to taxpayers and at no cost to the abandoned mine land ("AML") fund administered by the federal Office of Surface Mining ("OSM"). The estimated benefit of the reclamation work completed to date, which is performed under regulation by the Commonwealth's Department of Environmental Protection ("PaDEP"), is \$46 million. If this reclamation work is allowed to continue without regulation under Subtitle C of RCRA, Pennsylvania's waste coal plants expect to reclaim on average an additional 400 acres every year, with an estimated savings to taxpayers of \$8 million annually. (ARIPPA00273)

The beneficial use of ash for mine reclamation is regulated in Pennsylvania by PaDEP. Under PaDEP permits, the ash must be tested prior to placement, and the groundwater must be monitored at the ash placement site. The data demonstrates that (1) the concentrations of arsenic and other metals in the ash are lower than the TCLP standards, and in many or most cases are within the range of concentrations in the surrounding native soils; (2) arsenic and other metals leach from the ash at a far lower rate than native soils; and (3) the groundwater at the sites generally shows either no change or an improvement to background conditions. (ARIPPA00273)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (FW00277)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (FW00277)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (FW00277)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (KCC00298)

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To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (KCC00298)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (SMC00299)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (SMC00299)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (SMC00299)

The Pennsylvania Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments with no discovered adverse impact over a decade of monitoring. (PA00301)

At a cost of \$20,000 per acre to clean up, Pennsylvania residents have saved nearly \$46,000,000 with the 2,300 acres that have been cleaned up to date by the waste coal power industry. (PA00301)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (PA00302)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. (PA00302)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (PA00302)

While the EPA teeters over this decision, the Pennsylvania Department of Environmental Protection (DEP) has, for over a decade, comprehensively overseen and regulated the use of ash in reclamation and soil amendments monitoring and testing the use of ash and finding no adverse effects or impacts during this time period. (PA00305)

Having witnessed the reclamation site and process firsthand, I can tell you that the benefits of this project are quite enormous. Undesirable original materials taken from beneath the surface and later discarded there are now being utilized as an energy source. Even the ash-waste by-product that is produced is being used effectively to fill underground mine sites and craters resulting from surface mining, and, as in some cases, this alkaline ash is being used to neutralize and counter harmful acid mine drainage. (PA00305)

To date, waste coal-electric generation has cleaned up more than 2,300 acres-saving Pennsylvania taxpayers \$46,000,000. (PA00305)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (ACV00307)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (ACV00307)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (ACV00307)

The state Department of Environmental Protection (DEP) comprehensively regulates use of ash in reclamation and soil amendments and no adverse impacts have been discovered despite a decade of monitoring. (TEGI00308)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (TEGI00308)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (TEGI00308)

Through the end of 1998, the waste coal plants have removed over 56 million tons of coal refuse from Pennsylvania's landscape, and have used the resulting 37 million tons of alkaline ash to reclaim 2,300 acres of abandoned mine lands. This reclamation work has been performed at the plant's own expense, without any taxpayer dollars or grants from the limited AML funds that are distributed each year to Pennsylvania. (PMRABL0003)

The data demonstrates that the groundwater at the reclamation sites generally shows either no change or an improvement, often significant, to background conditions. The use of ash for mine reclamation has not resulted in ground water contamination in over a decade of monitoring ash samples and downgradient water. (PMRABL0003)

The reclamation work that is being done by private industry is a necessary part of the solution to an overwhelming problem. (PCCL0007)

The use of fossil fuel combustion ash is one of the best tools available to us for the reclamation of abandoned surface mines. Most (approximately 80%) of the ash that is used for reclamation in Pennsylvania comes from the 14 waste coal plants operating in the state. These 14 plants produce approximately 5 million tons of ash per year, and remove 8 million tons of waste coal from the barren refuse piles that are polluting our environment. Through the end of 1998, these plants have removed over 56 million tons of coal refuse from Pennsylvania's landscape, and have used the resulting 37 million tons of alkaline ash to reclaim 2,300 acres of abandoned mine lands. This reclamation work has been performed at the plants' own expense, without the taxpayer dollars or grants from the limited AML funds that are distributed each year to Pennsylvania. (PCCL0007)

The data demonstrates that the groundwater at the reclamation sits generally shows either no change or an improvement, often significant, to background conditions. The use of ash for mine reclamation has not resulted in ground water contamination in over a decade of monitoring ash samples and downgradient water. (PCCL0007)

In addition to the economic costs to industry, PG&E Gen encourages EPA to consider the costs to the public and the environment if the beneficial uses of FBC are restricted and prohibited without evidence of damage to the environment. The reclamation efforts during the last five years by Pennsylvania FBC facilities alone have reclaimed about 400 acres per year of unreclaimed lands at a benefit of \$6 million per year. This figure does not include the most important benefits: .

- restored land value once reclaimed for future use for habitat or development l water quality improvements
- stormwater and erosion abatement
- removal of highwalls, pits, shafts and similar hazards
- local economic impacts from improved aesthetics, land values and development opportunities. (PG&E00023)

In an effort to aid in your decision-making process, we are pleased to provide a representative sampling of data from the nearly 100 mine sites throughout Pennsylvania where ash has been used as a supplement for soils or minefill. These cases cover a variety of applications. We believe that the data demonstrate that the use of ash does not result in groundwater degradation when used in accordance with the regulations and guidance in effect in Pennsylvania. This result is the same whether the ash placement is within or above the water table. In many of the cases cited, the use of the ash resulted in a significant improvement in water quality. (PADEP00025)

IMCC believes regulation under Subtitle C would promote a “one-size fits all” approach that will discourage recycling of coal ash and thereby encourage the placement of coal ash in less suitable or more expensive disposal environments. A unique opportunity is afforded by the disposal of coal ash in coal mine spoil, because placement occurs in an environment where potentially harmful trace elements, contained within the coal ash waste stream, will be neutralized as a source of environmental degradation through natural processes of dispersion, attenuation, dilution and mineralization. These processes can often improve ground water quality in surface mine settings which involve the disposal of acidic coal processing waste or which are hydrologically connected to acid mine drainage from pre-law coal mining activities. (IMCC00027)

The IMCC believes coal ash haul back has the following advantages, among others, that should be considered by USEPA:

- Coal ash is returned to the same environment from which the coal was extracted.
- Returning ash to its place of origin preserves green space.
- Mineralization of the groundwater that accumulates in the mine spoil is an accepted consequence of surface coal mining. Research has shown adding ash to this environment will not cause an incremental increase of the accepted mineralization.
- The existing state programs under SMCRA provide the necessary environmental safeguards to protect the hydrologic balance and the public. (IMCC00027)

The Bureau believes there are important opportunities to improve current acid mine drainage remediation techniques with the proper utilization of coal combustion by-products (CCB). (MDE00047)

Simply put, we have not been able to find a single case of beneficial use of industrial combustion ash for mine reclamation that has caused deterioration of the environmental structures of concern. In most cases there is a significant net benefit over not using ash to reclaim, stabilize, and ameliorate acid drainage from abandoned mines. (CIBO00052)

The case study information clearly supports our industry held view that CCPs can be utilized in environmentally responsible beneficial end use applications within mine settings. (AEP00060)

As discussed in detail in the NMA comments and incorporated by reference herein, this practice presents many benefits (including, among others, a reduced need for “greenfield” sites for new utility disposal sites, and ameliorating potential acid discharges) and presents significant potential for ameliorating effects of CCP disposal on the environment due to superior attenuative capacity of mine spoils (compared to geologic materials present at typical CCP disposal sites) and the hydrologic characteristics of surface mine disposal sites. (WVDEPL0003)

The data demonstrates that the use of ash does not result in groundwater degradation when used in accordance with the regulations and guidance in effect in Pennsylvania. In many cases, the use of ash resulted in a significant improvement of water quality. (PADEP00246)

By using waste coal as fuel, these plants are cleaning up abandoned mine sites and waste coal piles across the state. The removal of these piles eliminates erosion, sedimentation and the production of acid mine drainage. In many cases the combustion by-product, a stabilized ash, is returned to the mine site and is used to recontour the site in a manner that approximates the original site before mining began. In this process, the ash neutralizes other acid-bearing materials while supplementing native soils to promote site revegetation. Pennsylvania’s waste-coal power industry has cleaned up more than 2,300 acres of abandoned mine lands, saving the Commonwealth nearly \$46,000,000. (PADEP000246)

The state Department of Environmental Protection (DEP) has monitored these sites and concluded that the application of coal ash in conformance with state requirements does not degrade groundwater resources. The department’s research suggests that in many cases the use of this material actually has improved water quality. (PA00247)

By reclaiming these sites, the electric power generating industry is also eliminating many potential safety and health hazards in the community. The abandoned waste sites pose the threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. Sedimentation and erosion problems are also eliminated in areas where streams are located nearby. (EPACAMR00248)

To date, more than 2,300 acres have been clean up, saving PA residents nearly \$460 Million. This estimate does not include the elimination of AMD. (EPACAMR00248)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (PCLP00249)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (PCLP00249)

By reclaiming these sites, the electric generating power industry is also eliminating potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (PAEC00251)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$446,000,000. (PAEC00251)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (G&L00252)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (G&L00252)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (PA00253)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (PA00253)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (CIN00254)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (CIN00254)

By reclaiming these sites, the electric generating power industry is also eliminating many potential safety and health hazards in the community. These unreclaimed waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (EPC00255)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46,000,000. (EPC00255)

The Ebensburg, Pennsylvania facility is one of 14 waste coal-fueled power plants operating in Pennsylvania. By burning waste coal as fuel, these plants are cleaning up abandoned mine sites and waste coal piles across the state. As you know, waste coal sites seriously threaten water quality and public safety. The Pennsylvania Department of Environmental Protection (PaDEP) has approved the alkaline CFB ash for use in reclamation programs for both active and abandoned mines. The ash is returned to the mine site to neutralize other acid bearing materials that could not be used as fuel and to supplement native soils to promote site re-vegetation. These coal refuse fueled facilities are a prime example of industrial operations that contribute to significant reductions in air, water, and solid waste emissions. By revitalizing abandoned industrial properties and returning thousands of acres of polluted and once wasted land back to a useful state, Pennsylvania's waste coal power industry provides environmental, societal, and economic advantages to the state, region, and country. (AIRP00270)

Use of FBC coal ash in soil amendments and mine reclamation is beneficial. (PG&E00274)

Coal ash generally, and FBC ash in particular, is superior to other till in its ability to be both flowable and compactable. It is an ideal construction material to fill and seal pits and voids, restore original contours of the landscape, stabilize coal refuse, and establish desirable surface water drainage patterns. The high lime content naturally amends the soil, promoting vegetative growth as a soil amendment. This lime content also creates cementitious chemical reactions in the ash, causing it to "set up" like cement when conditioned with water. As shown in comments from ARIPPA and others, FBC coal ash has levels of metal and contaminants generally in the same range as native soils, according to the U.S. Geological Survey, but in a form and in an alkaline environment that makes trace metals less leachable than in soils. These beneficial uses are decidedly not waste disposal, but rather the productive use of the by-product because of its desirable characteristics as a land reclamation material. (PG&E00274)

The cementing applications of fly ash that replace portland cement and avoid CO<sub>2</sub> emissions are not limited to fly ash in concrete. Specifically, with respect to EPA's RTC, the use of fly ash in many mining applications, particularly where flowable fill requiring low strengths are required, can eliminate most of all of the cement that would have been used. (ACAA00276)

Currently, the coal ash that the EPA is proposing to regulate as a hazardous waste is beneficially used as a soil supplement or minefill at 100 sites throughout Pennsylvania. The Pennsylvania Department of Environmental Protection has monitored these sites and concluded that the application of coal ash in accordance with state requirements does not degrade water resources. In some cases, the use of the coal ash has actually improved the water quality. (PA00293)

Public funds will only address only a small part of this backlog. Power companies are using coal ash to successfully re-claim abandoned mine land. Throughout Pennsylvania there are 14 waste coal- fueled power plants representing a capital investment of nearly \$2.5 billion. These facilities have already reclaimed 2,300 acres of abandoned mine land at no cost to taxpayers or the Abandoned Mine Land Trust Fund. (PA00293)

A by-product of the combustion process is an alkaline ash which the Pennsylvania Department of Environmental Protection (DEP) has approved for use in reclamation programs for active and abandoned mines. The alkaline coal ash is returned to the reclamation sites to neutralize other

acidic materials, allowing a reduction or elimination of acid mine drainage. To date, nearly 2,300 acres have been reclaimed this way in Pennsylvania. (PA00296)

Here in Pennsylvania the State Department of Environmental Protection has been regulating the use of ash in abandoned mines land reclamation and acid mine drainage abatement applications, as well as for agricultural land applications, for more than ten years with no adverse affects. Indeed, the PA DEP has noted a substantial reduction in the public safety risks associated with open, abandoned pits where these plants are situated and reductions in Acid Mine Drainage that have posed significant problems and ground water quality degradation throughout the Commonwealth's coal mining regions. (GPC00297)

The fourteen waste coal-fueled power plants in Pennsylvania have consumed tens of millions of tons of coal mining wastes thus far in their operational lives. The ash by product from these plants consumption of waste, mildly alkaline in nature, has been used to reclaim approximately 2300 acres of heretofore useless blighted land. The reclamation activity has "sealed off" hundreds of acres of land which was open to uncontrolled water ingress that contributed to the degradation of ground and surface waters in the area. Significant watershed improvements have already been noted in the areas where many streams are bereft of aquatic life for many miles. (GPC00297)

By reclaiming these sites, the electric generation power industry is also eliminate many potential safety and health hazards in the community. These waste sites pose a threat of accidental fires, and they are sometimes used as trash dumps or recreational areas for people using all-terrain vehicles. (PA00300)

To date, more than 2,300 areas have been cleaned up, saving residents nearly \$46,000,000. (PA00300)

The PA State Department of Environment of Protection (DEP) comprehensively regulates the use of ash in reclamation and as soil amendments with no adverse impacts despite a decade of monitoring. (AMI00372)

To date, more than 2,300 acres have been cleaned up, saving Pennsylvania residents nearly \$46 million. (AMI00372)

To date, nearly 2,300 acres have been reclaimed. With an estimated reclamation cost of \$20,000 per acre, Pennsylvania taxpayers have saved an estimated \$46 million. (PAL0001)

The Ohio River Basin Commission would like to express its support of the continued use of waste coal ash in mine reclamation efforts to improve downstream water quality. (ORBCL0002)

By utilizing waste coal as fuel, many plants are cleaning abandoned mine sites and waste coal piles throughout Pennsylvania. The removal of these piles eliminates erosion, sedimentation, and the production of mine acid drainage which can have far reach regional impacts. (ORBCL0002)

We would like to express support for the continued use of waste coal ash in mine reclamation efforts to improve downstream water quality. (SRBCL0006)



By using waste coal as fuel, many plants are cleaning abandoned mine sites and waste coal piles. The removal of these piles helps to control erosion, sedimentation, and the production of mine acid drainage which can have far reach, regional impacts. (SRBCL0006)

The common beneficial use of ash from Circulating Fluidized Bed (CFB) combustion boilers from electric cogeneration plants in Pennsylvania serves as a vital component in the reclamation of abandoned mine sites in our state. (LRCAXXXX)

Data collected at many reclaimed sites indicates improvement in surface water quality through the reduction of sediment runoff and surface-acid-mine drainage (AMD). Reclaimed sites also help reduce infiltration of surface water into underground mine pools which later discharge into streams and rivers as acid mine drainage. (LRCAXXXX)

The reclamation of abandoned mine sites in the anthracite fields of Northeast Pennsylvania is crucial to the restoration of ecological values and water quality in many streams and rivers in the Susquehanna and Delaware watersheds. This reclamation effort is also key to the economic and cultural recovery of the human communities adversely affected by the extractive history of the anthracite industry. (LRCAXXXX)

OSM shares EPA's concerns regarding the potential for contamination of groundwater and surface pathways from the use of some CCBs in mine reclamation. We believe that is possible that certain CCBs and associated materials may exhibit hazardous characteristics or pose unacceptable risks in some situations. However, we know of many examples where CCBs have been an integral part of successful reclamation under both Title IV and Title V. There is an extensive inventory of completed projects, and there are a number of ongoing projects in various stages of completion. As the EPA states in its report, the environmental benefits achieved through this reclamation have been extensive. In all of these projects, OSM and the States have ensured that the potential environmental and health and safety impacts of CCBs were evaluated. The enclosed copies of papers on successful reclamation were presented at national AML meetings highlighting the use of CCBs. (OSM00283)

We do not doubt that there are situations where underground mine disposal may be an appropriate disposal technique for certain coal combustion wastes. Conversely, we are just as certain that there are situations in which where such disposal practices are not appropriate. (ALA00292)

PG&E is not talking about the universe of fossil fuel combustion products or its disposal ... It is the specific application of a chemically reactive waste to address the problem of an uncontrolled chemical problem inherited from decades-old mining practices. It is a beneficial use of these materials, at least in the short run. Whatever regulatory structure the USEPA settles upon, there is probably a legitimate objective to use these materials for some types of abandoned mined lands reclamation. (GHIL0012)

It is important that the distinction between legitimate, engineered beneficial use and unregulated, wholesale dumping continually be drawn and emphasized. (GHIL0012)

PG&E's comments are reasonable, although there is a tendency to exaggerate some claims ... For example, even when the field reactor is built and performs to design, the resulting reactant water

may be neutral in pH and have low dissolved concentrations of RCRA metals, but it will be highly mineralized and, therefore, substantially degraded. It will be an improvement, but it is by no means good water. Further, it is not easy to get effective reaction between the FBC wastes and acid mine drainage ... In cases where flow-through is obtained, the reaction continues only until the alkalinity of the FBC waste is consumed ... The fix is often not permanent and in some cases the problem becomes worse after the FBC wastes are neutralized. (GHIL0012)

The primary difficulties with [the use of FBC wastes as materials for construction caps to reduce infiltration into acid producing materials] is that the barriers are frequently ineffective and, when initially effective, deteriorate quite quickly with time. The fix is at best temporary. (GHIL0012)

Although returning CCW to underground coal mines has fundamental merit, as landfills become more scarce, the US EPA and RCRA personnel need to conduct more research on the toxicity issue of CCW rather than ignore it. Toxic underground deposits of CCW will make their way back to the surface as a contaminant in groundwater when it is used for farm irrigation, landscape runoff into streams, public water consumption, etc. (VAT00309)

The Report downplays the significance of problems with minefills. There are basic differences between minefilling and the other disposal methods examined in this Report, i.e., landfills and lagoons, that are well known and should have been thoroughly discussed in the Report. Despite these obvious dramatic differences, the Report repeatedly gives minefilling the benefit of the doubt with unsubstantiated statements such as, "EPA believes that, under ideal circumstances, placement of wastes in mines should present no increased risks to human health and the environment relative to conventional landfills." in section 3.4.5. The Report erroneously labels minefilling a beneficial use when many minefills are simply open dumps, i.e. landfills without any design or construction standards and few operational requirements, used to avoid the costs of disposal at state solid waste landfills. These dumps are not being used for, "improvement of disturbed mine lands through contouring, revegetation, and reduced infiltration to mine workings, and abatement of acid mine drainage through neutralization and diversion." as emphasized in the Report (e.g. see page 3-51). (HEC00056)

While there may be a direct interphase between the wastes and shallow ground water aquifers in some lagoon disposal, many minefills expose ground water aquifers at multiple depths to direct rampant contact with large volumes of CCW that does not occur at power plant lagoons. (HEC00056)

Arguments in favor of minefilling are specious. Claims made by proponents of minefilling at EPA's May 21 Hearing and at a tour of minefills in Indiana on May 25 arranged for EPA by the Edison Electric Institute and the Indiana Department of Natural Resources appear to be based on the following three arguments:

- 1) Coal seams are underlain by 'fire clay' that will serve as a natural liner for CCW disposal in mines.
- 2) Minefilling cleans up the environment by neutralizing acid mine drainage; and
- 3) Any contamination from coal combustion wastes will be acceptable given that mining has already destroyed the ground waters in mine areas. (HEC00056)

The claim about fire clay is self-serving fantasy. There is no material in the geologic record or mine permit applications to support the notion that Mother Nature has benevolently provided ‘fire clay’ as the floor rock under most strippable coal deposits. Moreover, as we will describe, even in the few places where ‘fire clay’ is the floor rock, it cannot act as a ‘natural liner’ preventing toxic contaminants in the CCW from entering the groundwater. If a seam of clay mineral were the floor rock under the stripmined coal seam, could it act as a “natural liner” for CCW dumps? The answer is a resounding NO for these reasons:

A) Liners must be continuous with no weaknesses -- Impermeability is only as strong as the weakest link. Underclays are often discontinuous layers. For example, at a fact finding hearing held in 1995 concerning HEC’s appeal of the Little Sandy #10 Mine CCW disposal permit, hydrologist Russell Boulding documented that the claim of underclays retarding CCW leachate at this site was fictitious. A number of the lithologic logs including seven that were reported to be downgradient from or very near CCW monofills showed no underclay underneath the lowest coal seam to be mined where CCW would be placed. With adequate time to comment, we intend to document the absence of underclays at numerous mines and the presence of sand stones and sandy shales immediately beneath the coal seams that are aquifers, not aquitards.

B) Furthermore a well established fact that Boulding also testified about at this hearing, is that clay seams, as well as other types of floor rock, can, do and will sustain fractures from the blasting, operation of heavy equipment and stress relief from overburden removal in mining operations. “Soft” stripmining techniques have yet to be invented. Moreover, as the coal and overburden are removed, the floor rock will undergo “release fracturing.” This means when the weight of the overlying strata is removed, the floor rock will heave and buckle upward as a new equilibrium is achieved. (HEC00056)

Even if a continuous clay layer were present and somehow, magically, stayed intact throughout the high stresses of the mining operation, could it serve as a ‘natural liner’ containing CCW and preventing groundwater contamination? The answer is a resounding No. The assumption behind this myth is that groundwater carrying contamination from CCW could only travel downward and would be stopped by the clay seam and so could not affect the lower aquifers. The clay seam would not stop water and contamination from traveling horizontally and outward from the dump site. And, most importantly, stripmine pits are themselves an artificial aquifer system after mining and almost always have high permeability and increased flow rates through the disturbed areas including the areas where CCW is dumped. (HEC00056)

The fantasy of a ‘fire clay’ seam acting as a ‘natural liner’ also conflicts with the second claim that CCW neutralizes acid mine drainage. First, assuming neutralization benefits do occur, acid water must flow into the pit from somewhere, flow through the CCW, then flow out as neutralized water to somewhere else. The point of continuous liners is to prevent outflow. The electric power industry can’t have its cake -- clay as a ‘natural liner’ -- and eat it too -- CCW as a neutralizing agent for acid mine drainage. One claimed virtue will cancel out the other. (HEC00056)

High acidity is not the only geochemistry faced in mining operations. In fact, the Report should take into account problems that may occur at the other end of the pH scale in Indiana and many western states where the ground waters and spoil waters in active mining operations are alkaline. How

will these systems adequately buffer the excess alkalinity that millions of tons of alkaline ash may add to increased baseflows feeding the streams that drain mine areas? (HEC00056)

The third claim is perhaps most disturbing because it amounts to a brazen attempt to eviscerate the fundamental purposes of SMCRA. Strip mining can and does seriously degrade ground water. But the purpose of SMCRA is to minimize that impact and restore the environment of mined areas ... Yet after twenty years of telling us that they can readily meet these requirements, the proponents of minefilling now want us to believe that even in the absence of acidity problems, the ground waters in mines are so trashed that further contamination of them from disposal of massive quantities of CCW and other fossil fuel wastes would be of no consequence! ... The data does not back them up. Instead it indicates that contamination from disposal of CCW will substantially worsen water quality that has been degraded by mining. It shows that degraded spoil waters improve with time as their oxygen content reduces. It does not show that contamination from CCW will abate simply with the passage of time. (HEC00056)

The information on water quality indicates the surface mining law works. Damage is created by mining, but by isolating the toxic forming mine waste from its reactive agent, oxygen, the damage is limited and eventually corrects itself. It takes years, but the progress is real. On the other hand, burying reactive CCW at surface mines puts a toxic forming nonmine waste in the worst possible environment, in direct contact with its reactive agent - water. It is a disposal policy that is antithetical to the concept and practice of the surface mining law and it will condemn untold thousands of acres of useful or recovering mined lands to an indefinite future without usable water and without value. (HEC00056)

Nonetheless, many coal field residents-not to mention entire species of organisms-must contend with serious threats to life-sustaining water supplies, as CCW dumping in unlined strip mine sites becomes an ever-prevalent practice. (CITZ00261)

Returning it to former strip mines is adding insult to the injury they've already done to the land. These wastes seeping into the groundwater and possibly commingling other industrial wastes with them is not a good plan. (CITZ00262)

The EPA has the flexibility and discretion to adopt a program that is tailored to the specific problems associated with the "open dumping" of coal combustion wastes in mine backfill and voids, in order to assure protection of human health and the environment. As argued below, the co-disposal of coal combustion wastes in mining areas present heightened risks of contamination of groundwater and injury to public health that warrant assertion of Subtitle III authority over that disposal practice. (NCCLP00282)

The failure to assert jurisdiction over coal combustion wastes disposed of in coal mining operations will result in imminent and substantial endangerment to health and the environment. (NCCLP00282)

The failure to assert federal leadership in establishing up-front baseline standards concerning the disposal of coal combustion wastes under Subtitle III invites significant judicial intrusion into the field, and implicates the disposers, transporters and generators in a web of liability that is as open-ended as are the state management programs themselves. (NCCLP00282)

As will be later discussed, the failure to differentiate the rare beneficial uses made of CCW in mines from larger category of use of mines for cheap disposal, and the lumping together of such practices as ‘minefill’ obscures the reality of why utilities return combustion wastes to mined areas. (NCCLP00282)

The Council believes that the evidence of groundwater contamination from disposal of coal combustion wastes in situations comparable to the dumping of such wastes in mine backfill, is more than sufficient to warrant federal involvement in establishing baseline standards for coal combustion waste disposal in mining sites. (NCCLP00282)

It is a myth that there is no potential public health and environmental impact of improper management of coal combustion wastes. (NCCLP00282)

The available evidence suggests that disposal of coal combustion wastes in mine pits or other workings may be of particular concern, due to a number of factors: the increase in surface area available for leaching of elements resulting from fracturing of overburden and confining layers; higher total dissolved solids levels in mine spoils that compete for sorption sites on solids with toxic elements released from the buried ash; direct communication between surface and underground mine workings and aquifers through stress-relief fracture systems and subsidence-induced fracture flow; the dependence of residents of coal-baring regions on private, groundwater supplies and the significant potential for contamination of those supplies; and the presence of site conditions conducive to creation of acid or toxic-forming material that can solubilize constituents of concern from the waste. (NCCLP00282)

The use of the term “minefill” to loosely cover both “beneficial use” of coal combustion wastes and the disposal of such waste on minesites, masks the economic forces which result in such disposal. The presence of utility plants at minesites is a rare occurrence nationally, and the coal combustion wastes are being backhauled and disposed of in mine workings (including both underground mine voids and more commonly, in surface mine backfills or spoil/mine waste fills) not because of the beneficial attributes of the wastes relative to other materials or the lack of alternatives available to utilities and non-utility customers for coal combustion waste disposal, but because the coal companies offer the backhauling and disposal as a “service” or incentive in order to attract buyers for their coal in an increasingly competitive marketplace. (NCCLP00282)

Many utilities will not allow their waste to be co-disposed in mine voids and workings, preferring to manage their liabilities associated with the waste on-site or in a manner more controlled than the typical minesite. Those that do allow the waste to be managed in co-disposal situations assume that the problems with their waste streams will be masked by the significant hydrogeologic and chemical disruptions associated with mining operations, or that the contamination will not be discovered because of lack of adequate and sufficient monitoring. (NCCLP00282)

The report, at p. 3-51, assumes that the use of coal combustion waste can assist in mine “contouring,” yet the use of such material is neither beneficial nor needed for “contouring” of mine sites. Rather, such mining sites typically generate excess spoil material that must be disposed of in a separate spoil disposal site. It is the placement of this excess spoil in head-of-hollow and valley fills that has triggered the controversy over the practice of “mountaintop removal” coal mining in

the Appalachian coalfields, and the introduction of ash into the mined area will displace additional spoil, resulting in larger fills (and greater in-stream disturbances) or will result in larger fills with more direct disturbance to streams where the material is co-disposed in the fills rather than on mine benches or mine pits. (NCCLP00282)

The report assumes also that the dumping of coal wastes in mined areas is appropriate because it will “avoid[ ] development of Greenfield space for UCCW disposal.” This proposition is as absurd as it is arrogant, since, in the first instance, the proposition that more waste problems should be heaped on coalfield communities because the area is already disturbed, violates the core principle of the mining law that mining should be a temporary use of the land and that the land should be restored to productive uses comparable to the premining use. In the second instance, the proposition assumes that the location of the alternative disposal sites, which are dedicated ash impoundments or landfills, are “Greenfields”, when in fact they are typically located on-site at utility plants, on property that is otherwise utilized to buffer the air quality impacts associated with the power plants. (NCCLP00282)

The presumption of idealized circumstances for disposal at coal mines is a myth as well. Far from the homogenous, isotropic primary media flow through pore spaces in unfractured rock strata, providing for minimal vertical and horizontal groundwater flow, the coalfield regions of the east, midwest and west each present unique and complex hydrogeologic regimes that are naturally questionable at best for such waste disposal, and become more so through the disruption of the hydrologic regime and geology from blasting and subsidence associated with coal recovery from surface and underground mines. (NCCLP00282)

In sum, the placement of uncontrolled and unconsolidated deposits of coal combustion waste in mine backfills, valley or hollow fills, or underground mine voids, is irresponsible. The groundwater system in many coal fields is particularly vulnerable to contamination because of the high transmissivity of the fracture-dominated aquifer system, and because of the high degree of interconnection of aquifers through subsidence-induced deformation of strata above underground coal seams. Ample hydrologic evidence is available to suggest that further co-disposal of coal combustion wastes should be prohibited pending development of sufficient standards for the characterization, management, placement and monitoring of such disposal, and that EPA should move promptly to develop such standards. (NCCLP00282)

We have experienced first-hand the water contamination caused by various forms of coal mining. My students were amazed when they saw a creek near Freeburn, Kentucky with water that was a milky white. I am greatly concerned about the potential for even more groundwater contamination and the associated risks to human beings and other life forms if coal companies are allowed to continue the practice of dumping coal combustion waste (CCW) in strip mines. (CITZ00291)

The waste has very high levels of heavy metals such as mercury, arsenic, iron and many others. The way it is being spread over the land here will allow it to seep into the water table. This will take many years to take place at which time there will be absolutely no way to re-mediate the problem. (CITZ00329)

Our water supply will be ruined for future generations. This is all taking place because of the greed of the large corporations who will risk our future for a quick profit now. (CITZ00329)

Minefilling practices are posing an imminent and substantial endangerment to the environment and human health. (HEC00332)

Given the stability of mine sites as well as the direct and indirect hydrologic pathways between the wastes and groundwater supplies at these sites, disposing CCW, other fossil fuel wastes, other nonmine wastes mixed with these wastes or wastes whose parent materials are cogenerated with fossil fuels in strip mines without substantial safeguards violates the basic tenets of sound waste disposal policies. (HEC00332)

EPA has received testimony that clay beds underlying strip pits serve as “natural liners.” (See, for example, the testimony of Bradley C. Paul, EPA transcript, p. 181) Indiana has permitted strip mine pits as CCW dumps based on the assertion that the presence of a clay layer underlying the pit will serve as a “natural liner.” Such assertions are false and misleading, at best, for the following reasons: At best they are a figleaf: Clay beds do not line the sides and bottom of the entire pit. (HEC00332)

It is highly unlikely that a clay layer will retain its integrity during modern strip mining because of the mines’ reliance on blasting and heavy equipment. (HEC00332)

Moreover, clay layers are often discontinuous and do not extend underneath the entire pit. (HEC00332)

Indiana has no legislation to prohibit combustion ash and all of its heavy metals from being re-buried in mines in Indiana. In fact, I understand that the industry promotes this dumping as a practice. Since there are no “lime” requirements in Indiana our potable water supply may be at risk. (CITZ00341)

I am convinced that open dumping of CCW that has no restrictions on it is poisoning my drinking water. (CITZ00342)

When CCW is dumped in mine pits contaminants enter underground aquifers and eventually end up in well water. (CITZ00347)

I live in Knox County, Illinois where coal strip mines have been a feature of the landscape for decades. According to Jeff Stant of the Hoosier Environmental Council, eight wells in Illinois have been contaminated by CCW disposed of in strip mine pits. Agricultural pesticide and herbicide contamination of many rural wells is bad enough we don’t need or want another source of contamination. However, because strip mines continue to operate in Knox County and nearby counties and since there are plans to dump CCW in these mines, we fear that we will have another source of contamination to contend with. The dangers posed by CCW make me and others in rural Illinois even more concerned for the safety of our ground water. (CITZ00347)

Our coal mining sites already contain many dangerous substances, whether occurring naturally or introduced by man, and any additional toxic or hazardous wastes would only serve to compound our problems and increase the threat to our water resources. (DCCC00359)

I am aware to the new plants to dispose of 125 million tons of coal combustion waste in unlined mines in Indiana over the next five years. In particular I am concerned about the contamination of our water supplies with heavy metals, such as arsenic and lead, this procedure is certain to cause. (CITZL0008)

There are a number of scientists concerned about flushing CCW into underground exhausted coal mine shafts due to trace metal toxicity from fly ash particles accompanied by high levels of conductivity, total dissolved solids (TDS), and sodium (Na). (VATL0010)

I think relying on the strip mining industry to police itself is letting the fox into the henhouse. Allowing coal combustion wastes to be returned to former strip mines is adding insult to the injury they've already done to the land. These wastes seeping into the ground water and possible commingling other industrial wastes with them is an unacceptable answer. (CITZL0015)



## **VII. MINEFILL**

### **E. Universally Poor Applications**

EPA specifically asked commenters to identify universally poor minefill practices or scenarios. Commenters explicitly addressing this question (from industry, academics, and a federal agency) responded that they know of no universally poor practices and that site-specific evaluation can prevent difficulties from arising. One of the commenters specifically argued that placement below the water table cannot be considered a universally poor practice.

Response: Based on a review of the extensive case study information submitted by commenters, EPA believes that the environmental outcomes of minefilling are highly site-specific. Therefore, the Agency generally agrees that at this time there are no specific practices or scenarios that can be generically categorized as universally poor. There may, however, be site- and waste-specific conditions that result in negative outcomes or require a higher degree of control. We will continue to address this question as we develop regulations.

One commenter claimed that placement of coal combustion waste below the water table should not be considered a universally poor practice. While the Agency does not have enough information now to identify universally poor practices, we have concerns about placing coal combustion wastes in direct contact with ground-water in both surface and underground mines. We concluded in our recent study of cement kiln dust management practices that placement of cement kiln dust in direct contact with ground-water led to a substantially greater release of hazardous metals than we predicted would occur when the waste was placed above the water table. For this reason, we find that there is a potential for increased releases of hazardous metals as a result of placing coal combustion wastes in direct contact with groundwater. The Agency also recognizes that the very significant geochemical and hydrological differences between surface and underground mines may call for a tailored approach to regulation development.

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**E. Universally Poor Applications**  
**Verbatim Commenter Statements**

DOE is unaware of any minefill practices that are universally poor and warrant specific attention with respect to RCRA Subtitle C. DOE/FETC's experience with a wide variety of minefilling projects indicates that none have resulted in a consistently poor environmental performance. Even though several of the mine grouting projects described above did not achieve their objective of abating AMD from abandoned underground coal mines, they have not resulted in any significant environmental degradation, especially with respect to surrounding ground water and surface water resources. It should be emphasized that these projects were experimental in nature, and additional experiments of this type are needed to determine whether CCW minefilling can play a worthwhile role in the remediation of important environmental problems like AMD. For example, recent experimental work in the State of Oklahoma suggests that mine injection of alkaline FBC ash in dilute slurry form may have a more beneficial effect on AMD discharges from underground mines than CCW injection in the form of a low-permeability grout. (DOE00020)

ACAA's review of numerous published documents has revealed no indication of universally poor practices for mining applications of CCPs. (ACAA00022)

Testimony at the May 21 hearing revealed, and these and other comments confirm, that there are no minefill practices that, in the agency's own words, "are universally poor". While there are concerns that must be addressed in the utilization of CCPs at mine sites, those concerns are recognized and addressed by the existing state and federal regulatory regimes. (NMA00024)

Our members believe there are no universally poor applications for CCBs nor are there any universally acceptable applications either. In case by case evaluations, supported by technical data and environmentally sound management, CCBs can be applied in many uses which are benign to the environment. (WRAG00030)

NCE contends there are no universally poor situations for using CCBs in minefill, nor are there universally acceptable practices either. We believe that site-specific conditions merit individual review. This review should be conducted by local and state regulators rather than the Agency. (NCE00031)

The RTC implies that EPA may consider the placement of CCPs below the water table a "universally poor" practice. We disagree. It is important to recognize that a practice that is poor under the conditions of a given site may be beneficial at another. The lack of damage cases indicates that sound management practices and State regulations are adequate to insure protective placement of CCPs. (USWAG00037)

EPA posed the question "are there any minefill practices that are universally poor and warrant specific attention?" On the basis over 20 years of research experience on coal combustion byproducts (CCBs) and work with the Coal Ash Resources Research Consortium (CARRC, pronounced cars), a group with over 100 years of cumulative experience in CCB research, at the EERC the answer remains emphatically "no." (EERC00044)



## **VII. MINEFILL**

### **F. Frequency of Damage Cases**

EPA did not identify any proven minefill damage cases. Several industry commenters noted this fact and emphasized that absent any evidence of damage EPA can not find that existing practices are inadequate and therefore warrant EPA involvement. One of the commenters argued that elevated levels of constituents sometimes observed are principally the result of mining activity, not FFC waste placement. On the other hand, one public interest group commenter stated that EPA's study of minefill damage cases was inadequate and offered several case studies as potential minefill damage cases for EPA review. Another public interest group commenter stated that the lack of minefill damage cases is an artifact of inadequate monitoring by the states and argued that EPA should conduct an independent inquiry into damage cases associated with minefilling.

Response: EPA reviewed the extensive case study information submitted by academic, industry, and state government commenters along with the candidate damage case information submitted by the public interest group commenter. Based on this review and the damage case search conducted in support of the Report to Congress, EPA still has not identified any minefill sites with documentation of environmental damage sufficient to meet its "test of proof" for a damage case. The Agency notes, however, some case studies (including two of the candidate damage cases submitted by the public interest group commenters) in which the available data are suggestive (although not conclusive) of environmental impact from FFC waste placement. The Agency also notes a number of case studies in which the available data suggest an environmental benefit from FFC waste placement and reiterates the statement made several times above that the results of minefilling are highly site-specific. We also recognize that minefilling is a relatively recent practice, and that it may be too soon to identify damage cases that occur over an extended period of time. This is another reason suggesting that minefilling be approached in an environmentally protective manner to avoid future damages. The national regulations will address monitoring and oversight of minefilling practices.

Based on materials submitted during the public comment period, coal combustion wastes used as minefill can lead to increases in the quantity of hazardous metals released into ground water if the acidity within the mine overwhelms the capacity of the coal combustion wastes to neutralize the acidic conditions. This is due to the increased leaching of hazardous metals from the wastes. The potential for this to occur is further supported by data showing that management of coal combustion wastes in the presence of acid-generating pyritic wastes has caused metals to leach from the combustion wastes at much higher levels than are predicted by leach test data for coal combustion wastes when strongly acidic conditions are not present. Such strongly acidic conditions often exist at mining sites.

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**F. Frequency of Damage Cases**  
**Verbatim Commenter Statements**

Furthermore, since none of these damage cases involve the beneficial use of CCPs, either for agricultural purposes or for minefill, there is no basis for even considering subjecting CCPs beneficially used for these purposes to Subtitle C regulation. (NMA00024)

The Report to Congress is devoid of damage cases addressing use of CCPs for agricultural purposes or minefill. (NMA00024)

The fact that EPA has found no proven damage cases indicates that the combination of sound management practices and existing regulatory oversight has responsibly addressed any significant risks that might exist. (USWAG00037)

Furthermore, the existing data indicate that elevated levels of constituents in ground and surface water discharges, when they occur, are principally the result of mining activity, not from the placement of CCPs in the post-mining environment. (USWAG00037)

Simply put, we have not been able to find a single case of beneficial use of industrial combustion ash for mine reclamation that has caused deterioration of the environmental structures of concern. In most cases there is a significant net benefit over not using ash to reclaim, stabilize, and ameliorate acid drainage from abandoned mines. (CIBO00052)

In Indiana, the state agency that regulates mining, the IDNR, believes that rampant CCW disposal in post SMCRA mines can't worsen the water quality that is already in them. Yet according to IDNR submittals to HEC, it has only begun requiring the installation of monitoring wells on any consistent basis in spoil at mines regulated under SMCRA in the last ten years, electing not to require any such monitoring at the large majority of post SMCRA mines it regulates. A comparison of two mines that have wells in such spoil is illustrative ... [the commenter provides several pages of case study information] ... We would like to be given a reasonable period to furnish additional input and data on this fundamental issue of allowing permanent damage of strip mine lands. (HEC00056)

The Report concedes that minefilling is a widespread practice yet makes no attempt to define it, qualify it or quantify the extent of this practice. (HEC00056)

EPA's lax approach toward minefills in its Draft Determination and Report to Congress stems from the Agency's failure to carry out a crucially important assessment of actual damages from CCW and other fossil fuel wastes throughout the country. (HEC00332)

The Administrator is obligated to conduct independent inquiry into the nature and scope of damage associated with co-disposal of coal combustion wastes at mining operations and to collect such data as is necessary to support the conclusions with respect to regulation or non-regulation. (NCCLP00282)

Yet EPA has discounted the available evidence demonstrating contamination, and assumes erroneously that other sites have no contamination because no data exists demonstrating contamination. In truth, many of the disposal sites have never been monitored for groundwater impacts, nor have surface mining permits contained the full gamut of monitoring parameters, including numerous metals and radionuclides, needed to fully characterize the waste, its leachate, and its mobility in the chaotic hydrogeologic environment of an active or “reclaimed” mining operation. (NCCLP00282)

## **VII. MINEFILL**

### **G. Economic Impacts of Restricting Minefilling**

Various industry and state agency commenters suggested that the costs of minefill regulations or guidance were not considered by EPA. These commenters argued that imposition of regulations would have an unreasonable cost and/or economic impact. One commenter cited a cost of \$30 million dollars at one facility if minefilling were prohibited. Another commenter stated that the impact on Pennsylvania's waste coal plants would be at least \$312,500,000. Some of the commenters stated that minefilling with FFC wastes may provide the best or only economic alternative in some cases of abandoned mine land reclamation, and that these applications would become impossible (e.g., in Pennsylvania) if certain restrictions were imposed (or, for example, if operators were required to pay for greenfield development of landfill capacity and simultaneously bear the costs of reclamation of mine lands). One of the industry commenters indicated that Midwestern coal producers would be put at risk by a prohibition on minefilling. Other industry and state commenters specifically expressed concern that Subtitle C regulations would discourage reuse and recycling programs, to both economic and environmental detriment.

Response: Today's decision does not prohibit minefilling. We will establish national regulations applicable to the placement of combustion wastes in surface and underground mines. We believe that the cost of complying with regulations that address potential dangers will not have a substantial impact on this practice, because minefilling is flourishing in those states that now have comprehensive programs. Transportation and other costs and possible burdens of various alternatives will be considered. As stated elsewhere in these responses, we intend to develop regulations that take full advantage of the flexibility available to the Agency under RCRA authorities. Analysis of the economic impacts of the proposed regulations, as well as alternative approaches, will be an integral component of the upcoming rulemaking.

**VII. MINEFILL**  
**G. Economic Impacts of Restricting Minefilling**  
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Subtitle C regulation would not effectively address the issues associated with CCP placement in mines at reasonable costs. (IEU00018)

In addition, the economic incentives for using CCP as minefill are marginal due to the significant transportation costs and regulatory compliance costs that are currently in place, and any additional regulatory burden could easily tip the balance away from using CCP as minefill. (IEU00018)

EPA's suggested use of lined landfills is not a feasible alternative to beneficial use of FBC ash in minefilling and soil amendments for the two Pennsylvania facilities, which now devote 100 percent of their ash generation for these uses. By excavating and removing the culm banks and gob piles, PG&E Gen's fuels supplier acquires the reclamation responsibility for the waste coal site. (PG&E00023)

As described above, the Report to Congress does not appreciate the symmetry of the reclamation and remining in waste coal reuse projects because it concludes that landfilling could be accomplished for an additional aggregate \$52 million per year. Even if this number was correct, and PG&E Gen believes it is very much understated, it leaves out the additional cost of paying for alternative materials to complete the regulatory-required reclamation obligation, costs estimated at \$15,000-\$20,000 per acre. (PG&E00023)

Also not included in EPA's evaluation of costs is the impact on the communities from the loss of good jobs suited to the skills of a workforce still suffering from the continuing depression of the coal industry, if these remining and reclamation projects are not undertaken by CFB facilities. (PG&E00023)

The viability of the FBC waste-coal industry in Pennsylvania depends on the ability to remove the waste coal and achieve the reclamation standards required under state and federal environmental laws at reasonable and manageable costs. Placing the FBC ash in a landfill means the facility will have to pay for ash disposal and pay again to obtain inferior fill and soil materials to reclaim the mine site from which fuels were excavated. (PG&E00023)

Realistically, if mining reclamation with FBC ash is prohibited or burdened with additional regulatory burdens, the FBC plants will not be viable and will not be able to continue operating under their current conditions. (PG&E00023)

Imposition of Subtitle C hazardous waste rules would severely restrict, if not totally stop, such uses. (NMA00024)

Any action curbing beneficial use of coal combustion products will have a cost to the environment because:



- Virgin materials will be needed to supply needs that could be met by recycled coal combustion products thus exposing the environment to avoidable resource draw and disruption;
- Materials that could be recycled will consume landfill space in the environment;
- The finite pool of environmental protection dollars that can be drawn from the economy with acceptable competitive and lifestyle consequences will be utilized for actions that provide no net benefit to the environment while opportunities to make a real difference still exist. (NMA00024A)

EPA considered only the incremental cost difference of the ash management facility. EPA is considering a ban on minefill applications. The cost of materials handling and haulage to offsite disposal or utilization facilities can be a significant cost and the size of that cost is impacted by where the ash is hauled to. Many FBC units and rural electric cooperatives in the Midwest haul ash back to the minesites from which they buy their coal (or to a site only a few miles away). This means that the ash can be moved on a “back-haul” which costs only about 1/3rd of the cost of a “front-haul” to another equidistant site ... Thus there is about a 20% increase in cost or the same utility is now losing 76% of its generation earnings. (NMA00024A)

Dr. Paul’s analysis indicates that some Midwestern coal producers could be put at risk by an EPA prohibition on the use of CCPs for minefilling practices. (NMA00024)

A ban or major handling cost increase on minefills will eliminate the economic viability of many Midwestern coal producers. EPA failed to consider one other group. Many Midwestern coal producers are struggling to remain economically viable. They recognize that the utilities they supply must have a low fuel cost to maximize their competitive posture for marginal generation cost (which will control dispatch cost). These coal producers may take a very low margin on the coal they sell in order to provide a price per million BTU that is competitive. The coal mines, however, can integrate ash management with mining operations and even reduce their reclamation expenses. This allows coal producers to reduce utilities ash management costs while at the same time providing an earnings margin to the coal company. In short, many Midwestern coal companies are making their profit on the ash, not the coal. A ban on minefill applications alluded to in the Report to Congress will shut these mining operations down with devastating impact on the rural communities they serve. (NMA00024A)

EPA failed to consider the economic benefits that will be lost to end users of coal combustion products if regulations impede recycling. Most businesses that are now using coal combustion products are doing so because it is more economically viable than competing new materials. Taking away the ability to use low cost flowable fills, liming reagents, and ground and subsidence control materials will raise costs to mining, agriculture, and construction. With the currently low margins in mining and agriculture these costs may again be critical to the economic viability of entire regional businesses classes. (NMA00024A)

A decision by the EPA to regulate the management and beneficial use of waste coal for mine reclamation as hazardous would jeopardize all of these operations. Prohibitively high ash disposal sites would result in the closure of many of these facilities, with adverse environmental and economic consequences for dozens of small communities. (PAC00029)

On the other hand, managing these materials under RCRA will have compound costs, both in terms of material disposal and, in many cases, in the use of alternate materials and strategies to achieve the environmental benefits provided by coal ash. PCA believes EPA has underestimated these costs. (PCA00034)

Requiring overly stringent blanket regulations could result in expensive, unnecessary, and least beneficial landfilling of CCB products. (MDE00047)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize the comprehensive restoration effort throughout the coal-bearing regions of Pennsylvania. As per my understanding, this regulation would create prohibitively high ash disposal costs which would result in the closure of many generating facilities, with adverse environmental and economic consequences for dozens of small communities. (STR00050)

Further, waste minimization through ash reuse would be impeded with blanket regulations that would restrict certain applications unnecessarily. (CIBO00052)

If mine area disposal was eliminated as an option for these wastes, we estimate that installation and operation of an above-grade landfill to manage the wastes would add over \$30 million in capital and operating costs over the life of one of our facilities. (TXU00053)

A decision by EPA to regulate the management and beneficial use of waste-coal ash for mine reclamation as hazardous would likely cause the mine reclamation activities of Pennsylvania's waste-coal power industry to cease. Prohibitively high ash disposal costs that approach a 7,500 percent increase over today's cost levels would render many of the power production facilities economically unfeasible to operate. (PADEP00246)

A decision by EPA to designate waste coal ash used in mine reclamation as a hazardous waste most certainly will result in a dramatic increase in the cost and complexity of mine reclamation projects in Pennsylvania. (PA00247)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous materials would jeopardize these critical operations to reclaim abandoned mine lands. (EPACAMR00248)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. (PCLP00249)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous could jeopardize these operations. (PAEC00251)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economical consequences for dozens of small communities across the state. (G&L00252)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (PA00253)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (CIN00254)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (EPC00255)

Regarding cost, EPA estimated the incremental cost of requiring FBC ash currently used for mine reclamation and agriculture to be disposed in commercial Subtitle D landfill as \$52 million per year nationwide. This estimate is far below the actual incremental cost. ARIPPA understands that the cost of disposing a ton of material at a commercial Subtitle D landfill is \$45 -90 per ton at current rates. Taking the mid-range of \$67.50 per ton, the cost of landfilling the 500,000 tons of material that is produced annually by Pennsylvania's waste coal plants' would be \$337,500,000 per year. Assuming an internal cost of mine reclamation of \$5.00 per ton, the incremental cost would be \$62.50 per ton, or \$312,500,000 per year for Pennsylvania's waste coal plants alone. This incremental cost is approximately 75% of the estimated total annual revenue of Pennsylvania's waste coal plants. The impact of imposing additional costs equal to 75% of an industry's total revenue is obvious. (ARIPPA00273)

The cost of disposing a ton of material in a Subtitle C landfill is, we understand, \$155 - 170 per ton. At this rate, the cost of land filling the 5,000,000 tons of ash produced annually by Pennsylvania's waste coal plants would be \$775,000,000 to 850,000,000 per year. This cost exceeds our industry's total collective revenues. (ARIPPA00273)

Requiring that the landfilling of the ash produced by Pennsylvania's waste coal plants in either a Subtitle C or Subtitle D landfill would, by definition, stop the reclamation work that these plants currently are performing. The reclamation work that the waste coal plants are performing has broad public support in Pennsylvania, as evidenced by letters that have been submitted to EPA by, among others, the Pennsylvania Environmental Council, the Pennsylvania Department of Environmental Protection, the Joint Legislative Air & Water Pollution Control and Conservation Committee, the Majority and Minority Chairman of the Senate Environmental Resources Committee, the Chairman of the House Environmental Resources Committee, and other individual legislators. Copies of these letters are attached hereto as Appendix IV. (ARIPPA00273)

PG&E Gen notes that serious consequences would result if agricultural amendments or minefilling activities were regulated under Subtitle C. Among these consequences are severe economic impacts, including the likely closure of several power generation facilities. (PG&E00274)

In the current competitive electric generating marketplace, there can be significant economic impact to the industries and communities but, equally important, there would be significant negative environmental impacts if mine reclamation or agricultural amendment uses of this ash were to cease due to hazardous waste regulations. (PG&E00274)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (FW00277)

A decision by the EPA to designate waste coal ash used in mine reclamation as a hazardous waste will increase the cost and complexity of mine reclamation projects in Pennsylvania. Increased regulation on coal ash will prevent its beneficial application in mine reclamation and discourage the cleanup of unsightly and dangerous coal piles. (PA00293)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as a hazardous waste would seriously jeopardize these operations. (PA00296)

Such a designation would be a devastating blow to the continued operation of the fourteen waste coal-fueled Circulating Fluidized Bed (CFB) Boiler equipped electric power plants now operating in Pennsylvania as well as to the coal-fueled CFB equipped plants operating in West Virginia, California, New York, Colorado and Utah. (GPC00297)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (KCC00298)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (SMC00299)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities. (PA00300)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. (PA00301)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (PA00302)

An EPA decision to regulate this beneficial use of waste coal ash for mine reclamation would seriously undercut efforts to generate power and reclaim current waste coal sites. It is projected that ash disposal costs would increase more than 7,500 percent-closing many facilities and greatly impacting the wide-ranging advantages seen through these programs. (PA00305)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (ACV00307)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would jeopardize these operations. In some cases, ash disposal costs would increase by more than 7,500 percent resulting in the closure of many of these facilities, creating adverse environmental and economic consequences for dozens of small communities across the state. (TEGI00308)

Regulating waste coal ash in this way would have far reaching effects on Pennsylvania's taxpayers and the state's environment. (PA00368)

A decision by EPA to regulate the management and beneficial use of waste coal ash for mine reclamation as hazardous would create adverse environmental and economic consequences for dozens of small communities across the state. (AMI00372)

A decision by the EPA to regulate the management and beneficial use of waste coal ash for mine reclamation would jeopardize these operations. (PAL0001)

I am writing on behalf of the Pennsylvania Mining and Reclamation Advisory Board (MRAB) to express our concern about a potential regulatory determination in the above-captioned proceeding that effectively would prohibit the use of ash from the combustion of fossil fuels for mine reclamation. Such a determination would be very detrimental to Pennsylvania's efforts to clean up our legacy of past unregulated mining. (PMRABL0003)

A decision by the Agency to regulate the beneficial use of fossil fuel combustion ash for mine reclamation under Subtitle C would remove one of the few tools available to us for reclaiming abandoned mine lands, and would lead to the closure of the waste coal plants due to the economic impacts. The closure of the plants in turn would result in eight million tons of coal refuse and 400

acres of abandoned surface mines per year remaining unreclaimed for every year that the plants would have operated. (PMRABL0003)

I am concerned that the EPA would regulate the beneficial use of these wastes in a more rigorous and counterproductive manner. The scientific models and risk analysis criteria for human health and ecological pathways used in EPA's analysis seem to be extremely conservative and lean toward regulatory confinement of these materials to the economic detriment of the common beneficial uses. (LCRAXXXX)

The classification of CFB ash under RCRA will be counter productive to the future ecological and human health of the region. (LRCAXXXX)

I have a concern with the tentative recommendation in the EPA report that agricultural and mine reclamation use of FFCWs be limited to those materials with As concentrations no higher than that found in agricultural lime. Such a restriction would severely limit, if not eliminate, any beneficial use of these materials as soil amendments. (PSU00040)

By contrast, IDNR believes regulation under Subtitle C would promote a "one-size fits all" approach that will discourage recycling of coal ash and thereby encourage the continued placement of coal ash in Indiana's floodplain environments. We urge you to affirm that state regulatory authorities should continue to regulate placement of coal ash in mine sites under existing state programs. (IDNR00062)

Imposition of Subtitle C hazardous waste rules would severely restrict, if not totally stop, such uses. (WVDEPL0003)

Due to the geologic and hydrologic characteristics of Indiana surface coal mines, a ban on placement of coal ash below the water table would in fact be a prohibition on disposal of coal ash disposal many midwestern mines. (ICC00269)

A decision by EPA to regulate the management and beneficial use of waste-coal ash for reclamation as hazardous would likely cause mine reclamation activities to cease, which would impact regional water quality. (ORBCL0002)

A decision by EPA to regulate the management and beneficial use of coal ash for reclamation could jeopardize mine reclamation efforts. This could impede the significant progress that is being made to improve water quality in those areas of the Susquehanna River Basin that are affected by past mining practices. (SRBCL0006)

We, the undersigned members of the Pennsylvania Coal Caucus, comprised of members of the Pennsylvania Legislature are writing to express our concern with a potential regulatory determination in the above-captioned proceeding that effectively would prohibit the use of ash from the combustion of fossil fuels for mine reclamation. Such a determination would be very detrimental to Pennsylvania's efforts to clean up our legacy of past unregulated mining. (PCCL0007)

A decision by your Agency to regulate the beneficial use of fossil fuel combustion ash for mine reclamation under Subtitle C would remove one of the few tools available to us for reclaiming abandoned mine lands, and would lead to the closure of the waste coal plants due to the economic impacts. The closure of the plants in turn would result in 8 million tons of coal refuse and 400 acres of abandoned surface mines per year remaining unreclaimed for every year that the plants have operated. The legacy of such a decision by EPA would be 200 million tons of coal refuse continuing to blight our landscape, and 10,000 acres of abandoned surface mines continuing to scar our environment. (PCCL0007)

## **VII. MINEFILL**

### **H. Clarification of Minefill Definition**

One federal agency commenter noted that any minefill proposal from EPA should include a definition of minefill practices that are within the scope of the proposed rule, noting that some applications of FFC wastes in mining operations are too small to warrant attention. One public interest group commenter expressed concern that the determination would cover coal gasification waste and allow large volumes of this waste to be “dumped into ground water” through minefilling. The commenter purported that large volumes of this waste currently are minefilled under coal combustion waste provisions of state regulations. The commenter provided information on coal gasification, including site summaries for coal gasification plants on the National Priorities List. Another public interest group commenter expressed concern that the determination would allow unregulated minefilling of CCWs mixed with municipal incinerator ash and east coast river sediments and sludges. A citizen commenter was concerned that the determination would allow industry to minefill “almost anything” and call it CCW.

Another public interest group commenter stated that the use of the term minefill to cover both “beneficial use” of CCW and the disposal of wastes on mine sites masks the economic forces which result in such disposal. The CCW is not being hauled to the mine because of the beneficial attributes of the wastes relative to the alternatives but because the coal companies offer the backhauling and disposal as an incentive in order to attract buyers in an increasingly competitive marketplace. Another public interest group commenter was concerned about ambiguity in the term minefilling. Without common understanding as to what the word minefilling means, one cannot expect that minefilling will be regulated well or with consistency across states. Federal oversight should be employed to ensure that common definitions are used.

Response: The Agency will carefully consider the definition of minefilling during regulation development and address it in the proposal so that all stakeholders have full opportunity for notice and comment. The Agency will consider the appropriateness of addressing coal gasification. We believe that addressing the complex site-specific factors relating to geology, hydrology, waste chemistry and waste/geochemistry interactions, as well as other relevant factors will address the issues raised by commenters.



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**H. Clarification of Minefill Definition**  
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Because of the costs associated with underground placement of CCW, the minefilling of CCW at abandoned underground mines has been limited to cases where the filling of selected portions of the abandoned underground workings has been perceived to provide a potential low-cost means of sealing off the entrances to mine workings from the surface, or controlling other problems such as mine fires, mine subsidence, or acid mine drainage. For example, the injection of fly ash grouts (typically greater than 95 percent fly ash and 5 percent - 10 percent cement) into boreholes to prevent or control mine subsidence in localized areas beneath structures and roadways has become a fairly routine practice over the past 30 years. Stabilized flue gas cleaning wastes have also seen increased recent use in such applications. The quantities of CCW used in these applications are typically small, and the mine workings are typically far removed from drinking water sources. States may require that the CCW be chemically characterized to confirm their non-hazardous nature, but minimal environmental monitoring is typically performed in the field. DOE questions whether it would be appropriate for EPA to consider such small-scale grouting projects as "minefilling" that could possibly be subject to control under RCRA Subtitle C. (DOE00020)

It has no discussion or estimates of coal gasification wastes (also called manufactured gas plant or MGP wastes) generated per year. In Indiana, regulators within the Department of Natural Resources have decided that the wastes from one coal gasification plant are coal combustion bottom ash and without any public notice or review have begun dumping 120,000 tons of it into a surface mine (see Attachment ). EPA's data bases are replete with dozens of sites throughout Indiana and other midwestern states that contain large volumes of older MGP wastes, many of which are seriously contaminating the environment (see Attachment ). The Report does not recognize the potential for large volumes of this waste to be dumped into ground waters as "coal combustion waste" by states as a result of this Determination. (HEC00056)

Our very real concern is that these wastes are being spread and plowed over as 'reclamation limes'--the so-called 'alkaline addition' --that is, as if they were not only not hazardous, but 'beneficial.' You and I both know that the heavy-metal wastes and the radiation contamination alone of coal ought to preclude such reckless behavior on the part of our states. Yet, not only are millions of tons of such wastes dumped on old and new strip jobs across our region--but because of the mixed wastes loophole--we are having municipal incineration waste ashes mixed in with coal ash used for such bogus 'reclamations.' (PEACE00306)

Our state has furthermore embarked on a disastrous path in that our Governor is welcoming the millions of tons more of east coast harbor and river muds and sediments. Once more, under the mixed rule- -these are 'blended' with more incinerator ash--sky high in lead, cadmium and other dangerous materials--and brought into our state to spread on strip-mined land. EPA's own National Sediments Survey called these muds Priority One--most likely to be heavily contaminated with DDT, mercury, PCBs. Yet thanks to the weak and getting weaker regulations on coal combustion wastes--all this additional polluted material is heralded as magically 'beneficial.' (PEACE00306)

Not only do coal companies propose to dispose of bottom ash, fly ash and scrubber sludge from electrical generating stations, they propose to dispose of a other mine wastes that there may be. And this is in addition to wastes which mining personnel dump into the pit just before it is covered over. There is considerable data indicating that there are some extremely harmful elements in generating station wastes commonly called CCW's or Coal Combustion Wastes. This is not a satisfactory term to use since the coal operators want to dispose of almost anything in these pits and call them CCW's. (CITZ00328)

The presence of utility plants at minesites is a rare occurrence nationally, and the coal combustion wastes are being backhauled and disposed of in mine workings (including both underground mine voids and more commonly, in surface mine backfills or spoil/mine waste fills) not because of the beneficial attributes of the wastes relative to other materials or the lack of alternatives available to utilities and non-utility customers for coal combustion waste disposal, but because the coal companies offer the backhauling and disposal as a "service" or incentive in order to attract buyers for their coal in an increasingly competitive marketplace. (NCCLP00282)

As one example, based on the March Report and the comments received in response to it, it is apparent that the term minefilling has many meanings. In some cases, commenters treat it as surface mine reclamation, others assume it means activities to reduce acid mine drainage, some defend its role in mine subsidence, others assume it means disposing of wastes in underground mineshafts. If there remains ambiguity at this entry point; if there is not a common understanding as to what the word minefilling means, one cannot expect that minefilling will be regulated well or with consistency across states in the US. (ALA00292)

Taking federal action in no way means developing a one-size-fits all law. Instead, federal oversight will make sure that the same questions are being answered independently of the location of the minesite. Additionally, it will insure that common definitions are used. (ALA00292)

## **VII. MINEFILL**

### **I. Minefill Risk Modeling**

A few commenters offered specific criticisms of the ground-water risk modeling of minefills that was presented in the background documents for the Report to Congress.

Response: EPA performed some limited modeling of minefill scenarios during its early ground-water risk assessment. While the results of this preliminary modeling were presented in background documents, EPA concluded in the Report to Congress that the available tools were not suitable for modeling underground and surface mine situations because, for example, they are not able to account for conditions such as fractured flow that are typical of the hydrogeology associated with mining operations. Therefore, EPA has chosen not to rely on the preliminary minefill risk modeling presented in the background documents in making its Regulatory Determination. EPA, as noted in the discussions of risk modeling, will revisit this issue if the model review warrants.

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**I. Minefill Risk Modeling**  
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The geochemistry of the reactions that will be expected in the disposal of coal combustion waste in mine spoil and the final water quality to be expected at a receptor well is an issue EPA made a valiant effort to model. That model, however, has some unfortunate shortcomings which, hopefully, are remediable. (NMA00024B)

The fundamentals of the chemistry are not adequately considered in the EPA modeling (EPACMTP). The modeling produced similar results for the metals and arsenic in particular for a landfill and a minefill. After review of the inputs for the model (Appendix A of the Risk Report), the values used in the modeling for recharge and for the content of organic carbon were less in the minefill than in the landfill and the values for the content of iron in the unsaturated and the saturated zones were the same for both. All of these inputs are, at the very least, arguably incorrect in the direction which would lead to higher final values for metals, especially arsenic. Finally, the value (9.65 ppm) assumed for the starting concentration of the arsenic in the minefill and the landfill is roughly twice the hazardous-waste standard (5 ppm). This assumption, while fine for an initial study looking at the distribution of metals in the overall category of combustion wastes, is contrary to what the states would allow. A fairer representation of the conditions in a minefill, especially the recharge and the iron, would lead to even more dramatically lower numbers for the minefill environment. The risk associated with the expected concentration of arsenic should be less for mine spoil environments than for landfills. The modeling is not representative of the minefill environment. (NMA00024B)

Dr. Banaszak's analysis of EPA's input values for modeling arsenic levels for a landfill and a minefill determined that EPA incorrectly failed to account for the presence of iron oxides in the minefill scenarios, but assumed the presence of iron oxides in the landfill scenario. According to Dr. Banaszak, iron hydroxide is the single most effective remover of arsenic from solution; failure to account for such iron oxides in the minefill scenario leaves the buffering affects unaccounted for, resulting in unrealistic arsenic levels. Dr. Banaszak suggests that if EPA were to rerun the minefill model accounting for the appropriate iron oxide levels, the resulting levels of arsenic expected in a minefill scenario would not exceed and could very well be considerably less than, the levels of arsenic predicted in a landfill scenario. Dr. Banaszak's analysis also concluded that EPA wrongly assumed a starting concentration of the arsenic at roughly twice the hazardous waste standard, contrary to all state regulations and therefore a level that would likely never occur. (NMA00024)

Predictions with a Monte Carlo model (such as EPA used) are not valuable unless mine locations are considered. (CIBO00052)

The modeling activities of EPA also did not take into consideration the physical characteristics of the engineered ash minefills. A properly placed FBC minefill develops physical characteristics that begin to approach the properties of portland cement concrete; modest strength [1200 psi to 4500 psi], a monolithic structure [i.e. minimization of surface area for contacting waters] and low hydraulic conductivity [10<sup>-5</sup> to 10<sup>-7</sup>cm/sec]. All

of these characteristics contribute to a significant reduction of labile metals to contacting groundwater. In contrast, the EPA modelers assumed a lateral hydraulic conductivity for the placed ash of 300m/y [ $1 \times 10^{-3}$ cm/sec] which is fully 2- to 3- orders of magnitude larger than what might be anticipated in engineered minefills composed of FBC ash. (ARIPPA00019)

I am concerned that the EPA would regulate the beneficial use of these wastes in a more rigorous and counterproductive manner. The scientific models and risk analysis criteria for human health and ecological pathways used in EPA's analysis seem to be extremely conservative and lean toward regulatory confinement of these materials to the economic detriment of the common beneficial uses. (LRCAXXXX)

**VII. MINEFILL**  
**J. Coordination with Other Agencies**

One federal government commenter requested the opportunity to work with EPA in evaluating what controls might be appropriate for the use of coal combustion wastes in mine reclamation.

Response: EPA plans to work with the Department of the Interior's Office of Surface Mining, DOE and all other stakeholders as it develops regulations to implement this decision concerning minefilling.

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We also request the opportunity to work with EPA in evaluating what controls might be appropriate for the use of CCBs in mine reclamation. (OSM00283)

### **VIII. AGRICULTURAL USE**

The Report to Congress noted that EPA found risk at the  $10^{-5}$  level associated with agricultural application of FFC wastes. Based on this preliminary finding, EPA tentatively proposed to regulate agricultural practices or encourage voluntary limitations on practices, limiting the arsenic content in wastes to be land applied. In addition, EPA proposed that such limitations or regulations would extend to large-volume wastes managed alone (i.e., Part 1 wastes).

Comments were received on both sides of this issue. Many industry, academic, state government, and federal agency commenters disagreed with EPA's tentative conclusion. They indicated that EPA used unrealistically conservative levels for four key inputs used in our risk analysis and that use of a realistic level for any one of these inputs would result in a risk level less than  $1 \times 10^{-6}$ . The four inputs identified by the commenters were: application rate of the wastes to the land, the rate of soil ingestion by children, the bioavailability of arsenic and the phytoavailability of arsenic.

These commenters further recommended that EPA not regulate or encourage voluntary restrictions because:

- o agricultural use of coal combustion wastes creates no adverse environmental impacts and EPA identified no damage cases associated with this practice;
- o agricultural use of these wastes has significant technical and economic benefits;
- o federal controls would be unnecessarily costly and would create a barrier for research and development on the practice;
- o existing regulatory programs are sufficient to control any risks from this practice; and
- o the limits suggested in the RTC for arsenic levels in coal combustion wastes are inconsistent with limits applied to other materials used in agriculture.

A public interest group commenter urged the Agency to apply restrictions to the use of FFC wastes in agriculture because of concerns that the Agency's analysis of the risks and benefits of this practice was inadequate, as discussed in more detail under the sub-topics below. This commenter further suggested EPA should ban the application of conventional coal combustion wastes, and apply sewage sludge arsenic limits to the application wastes generated by fluidized bed combustors, which add lime as part of the process. One academic commenter, while disagreeing with aspects of the Agency's analysis, indicated that it would not be unreasonable for some sort of quality control to be applied using a regional approach.

**Response:** In the RTC we expressed concern over potential risks presented by agricultural use. We now believe our previous analysis assumed one unrealistically high model input, and that the risk across all reasonable scenarios, which we now estimate at high end to be approximately  $3 \times 10^{-6}$ , does not now warrant regulation of coal combustion wastes that are used in agricultural applications. This reduction in risk is based on reducing one of the key inputs identified by commenters, the soil ingestion rate for exposed children. The three other inputs identified by commenters as driving this analysis were also re-examined and EPA believes no change to these is warranted. This re-analysis is explained next.



Upon further review of the Agency's Exposure Factors Handbook (EFH), we decided to model a children's soil ingestion rate of 0.4 grams per day instead of the 1.4 grams per day that underlay the results given on the RTC.

Many studies have been conducted to estimate soil ingestion by children. Early studies focused on dirt present on children's hands. More recently, studies have focused on measuring trace elements in soil and then in feces as a function of internal absorption. These measurements are used to estimate amounts of soil ingested over a specified time period. The EFH findings for children's soil ingestion is based on seven key studies and nine other relevant studies that the Agency reviewed on this subject. These studies showed that mean values for soil ingestion ranged from 39 mg/day to 271 mg/day with an average of 146 mg/day. These results are characterized for studies that were deemed for short periods with little information reported for pica behavior. To account for longer periods of time, the EFH reviewed the upper percentile ranges of the data studied and found ingestion rates that ranged from 106 mg/day to 1,432 mg/day with an average of 383 mg/day for soil ingestion. Rounding to one significant figure, the EFH recommended an upper percentile children's soil ingestion rate of 400 mg/day. The Agency believes that this recommendation is the best available information to address children's exposure through the soil ingestion route. Reducing the ingestion rate to the EFH handbook recommended level of 400 mg/day reduced the calculated risk to  $3.4 \times 10^{-6}$  for this one child risk situation and suggests that agricultural use of FFC wastes does not cause a risk of concern.

There currently is uncertainty as to whether the central tendency value should be 100 mg/day or 200 mg/day, but this was not a factor in the high end analyses. There is also considerable uncertainty on pica child ingestion, with lack of data the primary problem. The EFH notes that as much as 10 g/day can be used in acute exposure assessments.

Phytoavailability is discussed in Section XVI. EPA believes its inputs for this variable are accurate, although there are studies that suggest phytoavailability will decrease over time. Arsenic bioavailability is a function of all sources of arsenic and EPA believes it has characterized this accurately. However, as noted in the conclusion to this response, arsenic toxicity is now being studied by the Agency in conjunction with a proposed new arsenic MCL and may necessitate re-visiting today's judgement on agricultural use.

Our technical analysis that resulted in revised risk is explained in a document titled *Reevaluation of Non-groundwater Pathway Risks from Agricultural Use of Coal Combustion Wastes*, which is available in the docket for this action.

The comment on inappropriateness of application frequency was caused by a misunderstanding of the language in the RTC. The rate used was actually every two or three years, not two or three times per year.

Two ongoing studies of wastes of potential use as agricultural soil supplements relate to the use of FFC wastes for this purpose. Although these did not play a direct role in EPA's decision regarding FFC wastes, they are summarized below and may play a role in any future review of today's decision.

(1) On August 20, 1999, the agency proposed risk-based standards for cement kiln dust when used as a liming agent (see 64 FR 45632; August 20, 1999). This analysis was completed in 1998 just prior to our completion of the analysis of FFC wastes when used as agricultural supplements. The CKD analysis underwent a special peer review by a standing committee that is used by the Department of Agriculture. We were not able to respond to the peer review comments in either the CKD proposal or in our assessment for fossil fuel combustion wastes, prior to publication of the Report to Congress. The comment period for the CKD proposal closed on February 17, 2000, and we will soon begin our review and analyses of the public and peer review comments.

(2) In December 1999, EPA proposed new risk based standards for the use of municipal sewage sludge under Section 503 of the Clean Water Act (the "503 standards"). It is important to note that municipal sludge has unique properties, application rates, and uses. This makes it inappropriate to transfer the 503 standards directly. Even though the standards cannot be used directly, there may be interest in the risk assessment methodologies used to support the development of these standards. We disagree that it is appropriate to establish an arsenic limitation for coal combustion ash when used for agricultural purposes equivalent to that contained in the EPA sewage sludge land application regulations. The organic nature of sewage sludge makes it behave very differently from inorganic wastes such as coal combustion wastes.

In the RTC we were not able to identify damage case associated with agricultural use. Nor do we now believe that this use of coal combustion waste presents a risk to human health or the environment. While some commenters supported restricting or banning agricultural use of coal combustion waste, no commenters provided information to show risk or damage associated with agricultural use or could show that existing regulatory practices are inadequate.

We recognize the comment that this practice is considered by many to offer economic benefits and that controls would have an associated cost. If future regulation is considered, these factors will be investigated .

We conclude at this time that arsenic levels in coal combustion wastes do not evidence potential for risk to human health when used for agricultural purposes. We expect to continue to review and refine the related risk assessments noted above, and will consider comments on the Agency's CKD and municipal sludge proposals, as well as new scientific developments related to this issue such as additional review of the EPA MINTEQ model that was used as a component of our risk analysis. Also, the ongoing research into arsenic toxicity may impact today's finding. If these efforts lead us to a different understanding of the risks posed by coal combustion wastes when used for agricultural purposes, we will take appropriate action to reevaluate today's regulatory determination.

Specific concerns raised by the commenters with regard to this decision are addressed in the additional responses below.

## **VIII. AGRICULTURAL USE**

### **Verbatim Commenter Statements**

The regulation of some CCBs for agricultural uses under Subtitle C, would result in unnecessary federal regulation of these materials, in spite of existing effective and less costly state mechanisms. (OSU00015)

However, OCDO is concerned that the report suggests a possible need for federal regulation under Subtitle C for agricultural and minefill applications, and strongly recommends this not be implemented for the following reasons. (ODOD00017)

It would be unwise and overly restrictive to establish federal standards that would apply to broad categories of CCPs and uses. (ODOD00017)

The results of these projects show that EPA should not subject the beneficial use of CCW to Subtitle C regulation in agricultural applications, and that Subtitle C regulation should not be applied to the previously-exempted large-volume CCW. (DOE00020)

DOE believes that EPA should not subject practices involving the use of coal-fired utility co-managed wastes (Volume 1, Section 3, Recommendation No. 3, page 3-6) or fluidized bed combustion wastes (Volume 1, Section 5, Recommendation No. 3, page 5-3) for agricultural purposes to some form of regulation under RCRA Subtitle C. DOE also believes that EPA should not reconsider the part 1 wastes in this respect, as stated in Volume 1, Section 3, page 3-7. (DOE00020)

In 1999, the regulation of agricultural applications of CCPs under Subtitle C, or some management system between Subtitle C and Subtitle D regulation, is not needed. (ACAA00022)

The states have demonstrated not only that agricultural and mining applications of CCPs are satisfactorily regulated at the state level, but also that further regulation at the federal level is not needed. (ACAA00022)

While PG&E Gen's utilization of ash in agricultural uses is less significant, ash serves as an effective soil amendment and substitute, is physically and chemically similar to soil and agricultural lime and, again, adequate regulatory controls are in place. (PG&E00023)

To the extent that EPA is considering the option of subjecting coal combustion wastes used for agricultural purposes to some form of regulation under Subtitle C, PG&E Gen does not believe the analysis undertaken to date supports that conclusion. (PG&E00023)

PG&E Gen disagrees with the tentative option of subjecting practices involving the use of FBC wastes for agricultural purposes (i.e., as a soil nutrient supplement or other amendment) to some form of regulation under Subtitle C. (PG&E00023)

For the reasons set forth in detail below, NMA opposes the suggestion by EPA that any form of RCRA Subtitle C regulation is appropriate for the use or disposal of CCPs for agricultural

purposes or for minefill. NMA urges that in the Regulatory Determination, EPA decide that the beneficial use and disposal of CCPs for agricultural purposes and for minefill should continue to be exempt from RCRA regulation. (NMA00024)

The WRAG would urge the Agency not to implement federal regulations under Subtitle C for agricultural or minefill applications of CCBs and believes that current local oversight adequately addresses the issues raised by the Agency. (WRAG00030)

In conclusion, New Century Energies strongly believes that sufficient guidance is available at the state and local level pertaining to applications of CCBs in agricultural and minefill applications. Coals differ widely in their composition, and site specific water, soil and climatic conditions vary enormously across the United States. It is scientifically inappropriate to apply blanket restrictions to a material that can be beneficially used in a vast number of applications based on the above mentioned variability's. Historically successful applications of CCBs in mining and agricultural applications demonstrate that CCBs can be used beneficially and certainly with no negative environmental impact. Therefore, we see no need for federal regulation under Subtitle C and believe the proper management of CCBs is a sound environmental practice. (NCE00031)

Therefore, regulations on agricultural uses of CCPs should fall under some form of state or regional control based on the state or region's specific agricultural need or criteria. (BMT00032)

PCA also refers EPA to the voluminous technical information and comments submitted by the Pennsylvania Department of Environmental Protection (DEP), which show the Commonwealth's history of responsible management of these substances, and the resulting benefits of such use. This evidence clearly demonstrates that management of coal combustion wastes under the Resource Conservation and Recovery Act (RCRA) is unnecessary and counterproductive. As DEP's collected data clearly illustrate, ash has been used in a variety of contexts -- including minefilling, agricultural soil supplementation and beneficial use -- without degradation of groundwater .(PCA00034)

USWAG disputes EPA's preliminary conclusion that agricultural applications of coal combustion products may present unacceptable risks. EPA's preliminary findings are based on a seriously flawed risk assessment performed without consultation with the U.S. Department of Agriculture and without reference to the tremendous body of scientific research sponsored by Federal agencies, the states, and industry. If EPA takes full advantage of the available information, it will recognize that agricultural applications of coal combustion products are environmentally sound beneficial uses with significant market potential. If for some reason EPA doubts the adequacy of that information, it should undertake a comprehensive joint study with the U.S. Department of Agriculture to address agricultural applications of waste products. (USWAG00037)

We agree and would like to endorse these comments by ACAA and The Ohio Coal Development Office that specifically address their concern for not interfering with or complicating beneficial uses in agriculture and minefill applications. (DTC00038)

We feel using the lower concentration level, i.e. that found in agricultural limestone as a standard limit would be too restrictive. Site specific controls would best be administered at the state government level, i.e. RCRA Subtitle D. (DTC00038)

N-Viro strongly supports the appropriate regulation of potentially harmful materials that are added to our soils during recycling and our own QA/QC program is our commitment to the goal of marketing the highest quality products. We insist, however, that such regulations be based on sound science. A reexamination by EPA of the As risk assessment will show that appropriate use of CCBs for waste treatment and as soil amendments is a wise use of these materials. (NVIC00039)

I have a concern with the tentative recommendation in the EPA report that agricultural and mine reclamation use of FFCWs be limited to those materials with As concentrations no higher than that found in agricultural lime. Such a restriction would severely limit, if not eliminate, any beneficial use of these materials as soil amendments. (PSU00040)

Virginia Power does not agree with the Agency's conclusion on re-opening the 1993 regulatory determination for agricultural beneficial use because of concerns with a specific co-management practice. (VAP00042)

Once again, APS is generally in agreement with the EPA's tentative conclusions presented in the RTC. Our concerns are primarily associated with the apparent overstatement of the arsenic risk associated with land disposal and agricultural application of coal-fired FFC wastes. (APSC00043)

The "Report to Congress" also raises some issues that need to be addressed. Specifically the need for regulation of CCBs for agriculture and mineland reclamation is proposed. Many very beneficial products used in agriculture (e.g. fertilizers and pesticides) have both great potential for good and also potential for harm. The key is to provide a proper framework within which these products can be used. (OSU00046)

States have the ability to develop effective landfill, mine reclamation, and agricultural programs. These programs are developed within each state and can best reflect their unique environmental factors, social and economic needs. It appears that current regulation of these activities is more than adequate. Consequently, existing RCRA Subtitle D regulatory authority should remain adequate for governing the management and beneficial use of CCPs in the future. (ISG00048)

TVA generally supports the conclusions of the RTC, but does not agree with EPA's recommendation to consider some form of Subtitle C standards for the use of CCPs in agricultural use. (TVA00049)

We believe there is abundant data that support a technical foundation for pursuing commercial use of CCPs in agriculture and in mine reclamation without compromising the health or safety of the public or the environment. (TVA00049)

However, EPA tentatively decided that some regulation or voluntary controls may be needed for beneficial use of coal combustion wastes in agricultural applications and for the disposal of oil combustion wastes. We believe there is sufficient detailed information in the docket from public testimony to support continued exemption from Subtitle C for these uses and applications as well. (CIBO00052)

In summary, the conclusions presented by EPA on arsenic health risks for agricultural uses of coal ash were not based on sound science. To impose a higher standard on coal ash for health risk analyses compared to other EPA health risk analyses (i.e. EPA 503(b) Sludge Rules) is not fair to farmers or to industry. NSP and industry has extensive experience using coal ash in agriculture, and state regulatory agencies provide regulatory controls to protect human health and the environment. The purported risk “documented” in the EPA health risk analysis does not reasonably exist, and there is no justification for EPA to consider additional regulatory controls based on a flawed analysis. Until EPA corrects the flaws in the health risk analysis, those flawed conclusions will continue to undermine both EPA credibility and the state permitting process. (NSP00057)

With policy to tackle the higher risks first, it seems clear that such intense focus on FFCB is inappropriate when the large land area with excessive soil As is known to exist in the US. Orchard soils are being converted to housing developments with high As soils except where State Agencies have worked to regulate this risk. Especially considering the multiple errors in risk assessment evident for As in FFCB, potential designation of such beneficial products as hazardous is not appropriate. (PHS011)

I urge EPA to consider these factors. In doing so, I am confident the Agency will conclude that there is no justification for regulating the beneficial use of approved coal ash and waste coal ash in mine reclamation and agricultural projects as hazardous waste. (PADEP00246)

We urge the Agency not to expand RCRA to include regulating the beneficial use of non-hazardous CFB ash in agriculture or mine reclamation. (AIRP00270)

PG&E Gen urges EPA to continue the current RCRA exemption of coal ash in beneficial uses for soil amendments and mine reclamation. (PG&E00274)

In our initial comments, we explained that EPA’s agricultural use risk assessment is grossly inadequate to support a determination to impose restrictions on this beneficial use ... The current record would not support a determination to impose Subtitle C or Subtitle C-like limitations on this use of FFC products. (USWAG00275)

As set forth in its initial comments, CIBO asserts that available scientific, analytic, demonstrative, and other data clearly sustain the conclusion that no aspect of the substances addressed in the RTC should be subjected to national Subtitle C regulation. Further, sound RCRA policy requires this outcome. Environmentally protective reuse policies for the wastes covered by the RTC exemplify the resource conservation and recovery that Congress encourages in RCRA. *See, e.g.*, 42 U.S.C. 6901(a), 6902(10). Further, that States have overseen through regulation and monitoring the development of successful environment-protective reuse policies of these wastes also fulfills Congress’s goal of active State participation. *See e.g.*, 42 U.S.C § 6902. The extension of federal Subtitle C authority over environmentally-effective reuse policies would undermine the core objectives of RCRA. CIBO asserts that all available data demonstrates that all wastes and applications covered by the RTC should remain under the Bevill exemption. (CIBO00280)

Some of the conclusions reached in that report are inconsistent with the EPA’s recognition that waste coal ash is not a hazardous material and is exempt from regulation while the agency is

continuing to consider the regulation of waste coal ash used beneficially in mine land reclamation and as a soil amendment in agricultural applications as a hazardous waste material. (GPC00297)

I write to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in its second Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants. Specifically, EPA determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agriculture amendments as hazardous waste. (PA00368)

I would like to express my concern about the Environmental Protection Agency's inconsistent conclusions contained in the above referenced report to Congress. Specifically, EPA has determined that waste coal ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial use in mine reclamation and agricultural amendments as hazardous waste. (AMI00372)

I have enclosed for your review a copy of correspondence date 9 September 1999 addressed to you by Pennsylvania Department of Environmental Protection Secretary James M. Seif, requesting that you determine coal-ash and waste-coal ash in mine reclamation and agricultural projects as non-hazardous waste. Although I am not an expert in environmental issues, I defer to the expertise of Secretary Sief on this issue, and concur in the arguments he makes in his correspondence for the determination of this ash as non-hazardous. I respectfully request that you give careful consideration to Secretary Sief's analysis on this matter. (PAL0004)

As a result of these concerns and because we question whether use of these wastes for agricultural purposes can be termed beneficial, we recommended that EPA develop federal threshold standards for use of co-combustion coal wastes that mimics the effort the Agency has undertaken for land application of biosolids. Because of the wide variability in metal content within wastes, these standards should require that each batch of ash be tested prior to be deemed acceptable for land application. Tested waste should be kept segregated until results have been obtained. (ALA00036)

Land application of FFC wastes, particularly fly ash and bottom ash from coal combustion and oil wastes, should not be permitted. Land application of fluidized bed combustion waste material should not occur in the absence of federal oversight, anti arsenic concentrations in this waste should be limited to levels currently required for land application of sewage sludge. (ALA00292)

We requested that EPA distinguish between those wastes that were suitable for land application and those that are not. Additionally, it is EPA's role to explicitly distinguish beneficial use of wastes and land disposal of wastes. We continue to recommend that the rules regarding the land application of sewage sludge, 40 C.F.R. part 503, be used to define acceptable metal concentrations in FFC wastes to be disposed of via land application. (ALA00292)

This research raises important questions both from a land application perspective and from the perspective of collecting and disposing of leachate prior to land application of fly ash. Until these are issues are resolved, EPA cannot consider allowing land application of FFC wastes to occur without federal oversight. (ALA00292)

We urge the Agency to restrict the application of FFC waste to agricultural land to FBC wastes only. First, the other types of waste - CCW and oil waste - have higher concentrations of arsenic and other metals in them, and second, the only risk analysis done was for FBC wastes. In addition, arsenic concentrations should be limited to the levels currently required for land application for sewage sludge. (ALA00292)

The agency has stated that some form of control under Subtitle C may be appropriate given identified potential risks from exposure to arsenic. Although I do agree with others that the risk assessment was flawed, it would not be unreasonable for some sort of quality control to be applied for agricultural use as is the case for other fertilizers utilized in agriculture. (EERC00044)



## **VIII. AGRICULTURAL USE**

### **A. Information Provided**

Many commenters provided detailed information on agricultural application regulations and guidelines in specific states, case studies, factors determining risks from the practices, and other research materials.

Response: EPA thanks the commenters for the extensive information provided. EPA has considered this information in its entirety. This information is reflected in today's revised estimate of risk from agricultural application.

**VIII. AGRICULTURAL USE**  
**A. Information Provided**  
**Verbatim Commenter Statements**

The food and feed uses of CCBs has been studied by researchers for over 20 years. A vast amount of research information is currently available on this subject. I have enclosed a selected list of reference information for the review of the agency. This reference list contains information on the food and feed uses of many different types of CCBs (particularly flue gas desulfurization (FGD) - gypsum quality and fixated, fluidized bed combustion (FBC) ash, fly ash, bottom ash), lime, and sewage sludge. It includes plant uptake data for over a dozen elements (arsenic, selenium, boron, cadmium, lead, molybdenum, zinc, calcium, magnesium, phosphorous, sulfur, aluminum, copper, etc.). The effects of using CCB's on many different types of plants and animals have been evaluated. The plants evaluated include vegetables (cabbage, bean, lettuce), crops (alfalfa, corn, wheat, barley, oats, soybean, cotton, tobacco), fruits (apple, peach), forage species, legumes, sweet clover, millet, ryegrass, red clover and trees. The animal species studied include sheep, swine, lamb, goat, finishing steers, bees, quail, and aquatic organisms. It seems that USPEPA has not evaluated the results of these laboratory and field studies while evaluating the risks related to agricultural uses. (OSU00015)

DOE's research in this area (which is summarized in matrix form in Appendix 1), includes ... Field-scale projects involving the agricultural application of CCW which showed that the release of arsenic is negligible ... Supporting documentation and data from each of these studies are provided in the body of these comments. (DOE00020)

Summaries of several pertinent research studies sponsored by FETC are provided below. Special emphasis is placed on the results of these studies (summarized in Table 4) as they pertain to arsenic, because this is the pollutant of concern identified by EPA in its RTC ... [comment provides several pages summarizing research studies]. (DOE00020)

A summary of a research study recently completed for FETC by the USDA is provided below. Special emphasis is placed on the results of this study pertinent to arsenic, since this is the pollutant of concern identified by EPA in its recommendations ... [comment provides several pages summarizing a study of feed lot applications]. (DOE00020)

The use of CCPs in agricultural applications has been a topic of research for over 50 years. In the last 20 years more than 20 electric utilities have funded research on the use of CCPs as soil amendments and in land reclamation, the results of these studies have been summarized in a report by Horn (1995). In addition, more than 60 research papers on agricultural applications have been presented and published at symposia sponsored by ACAA from 1967 through 1999 (Attachment 1). Furthermore, research concerning the use of CCPs has been conducted by the United States Department of Agriculture (USDA), the United States Department of Energy (DOE), the United States Bureau of Mines (BOM), the United States Office of Surface Mining, Reclamation and Enforcement (OSM), and the Tennessee Valley Authority (TVA). The types of CCPs investigated have included fly ash, bottom ash, FGD material, FGD gypsum, and fluidized bed combustion (FBC) ash. (ACAA00022)

There have been several recent publications which summarize large volumes of work done on the agricultural applications of CCPs. A recent report (Horn, 1995) contains a survey of existing information on studies in the USA of agricultural applications of CCPs with emphasis on unpublished information volunteered by many electric utilities. The information was obtained through research and demonstration projects by electric utilities concerning the potential for land-application uses of CCPs from their own power plants. Most of this research was accomplished with supporting projects conducted by state agricultural universities that used CCPs as experimental materials in agronomic research. As a result of the studies being done at different locations and by different institutions, the database on the effects of CCPs on crops and soils encompasses a wide range of experimental conditions, approaches and objectives. While this makes the extrapolation of the data to other regions difficult, the experience and data obtained is extremely valuable to an overall understanding of the effects of CCP interactions with soils and plants grown under very different conditions; and, it further facilitates the identification of potential problems and benefits. The unpublished work covered in this survey was augmented by a review of the published literature, which helps to provide a sound framework for the consideration of the results obtained in the various studies. It is noted that much of the published information specifically dealing with the use of CCPs in agricultural applications has been supported by the electric utility industry. This subject study (Horn, 1995) found that ... [comment provides several pages summarizing this study]. (ACAA00022)

A comprehensive study of fly ash and FGD materials done in Georgia (Sumner et. al., 1995) examined the environmental characteristics as well as agronomic characteristics of several fly ash and FGD products in both greenhouse and field experiments. This study is unique in that it also includes some marketing data that puts dollar values on CCPs as a soil amendment. Some of the findings of this study are as follows ... [comment provides several pages summarizing this study]. (ACAA00022)

A chapter (Korcak, 1998) on CCPs is included in a recent USDA report titled Agricultural Uses of Municipal, Animal, and Industrial Byproducts. This chapter outlines the potential benefits from CCPs including: alleviating trace element deficiencies; modifying soil pH; increasing the levels of needed Ca and S; and improving water infiltration rates, increasing depth of rooting and drought tolerance. Both FGD and FBC materials were found to have particularly high potentials for improving water use efficiency, product quality and productivity of soil-crop systems. The need for on-farm implementations to assess how CCPs fit into agricultural systems is also mentioned. (ACAA00022)

Some CCP-based soil amendments are reaching the marketplace. A paper by Franciosi (1997) outlines how a mixture of select organics and coal fly ash was composted to produce a potting mixture used in the greenhouse industry in North Carolina. This product met the approval of both the North Carolina Department of Health, Environment and Natural Resources and the North Carolina Department of Agriculture, Plant Division. A pelletized FGD material has also been marketed as a soil amendment (Fisher and Franciosi, 1997). This product was registered as a byproduct landplaster in North Carolina and as a fertilizer in Virginia. A composted product containing spray-dryer material (a type of FGD material including fly ash) is being marketed in South Carolina. (ACAA00022)

EPA's Report to Congress includes limited information on state regulation of agricultural CCP applications. Some examples of such regulations that have been successfully developed and implemented at the state level are reviewed in the following sections ... [comment provides several pages summarizing state regulation of agricultural use]. (ACAA00022)

EPA would like to limit the amounts of As applied through agricultural applications of CCPs to be similar to the amounts of As applied through the use of agricultural limestone (ag-lime). A recent publication on limestone (Oates, 1998) gives ranges for impurities/trace elements in commercial limestones. Another study of carbonate rocks in the Ohio Valley (Dever, 1999) gives a range of 0.41 to 250 mg/kg. This is quite similar to a range reported in CCPs by EPA 0.2 to 279 mg/kg (EPA, 1988). (ACAA00022)

EPA requested specific information and case studies on the experience with beneficial uses of FBC ash for minefilling and soil amendment. PG&E Gen selected several different types of beneficial use projects to present here ... [comment provides several pages summarizing case studies]. (PG&E00023)

When used as a soil amendment at a mine site in Pennsylvania, the beneficial use of FBC ash requires both a beneficial use approval under the waste management regulations and a mining permit module 27 approval, similar to the regulatory structure described above. The module 27 approval requires consideration of the specific characteristics of the ash and the existing soils, and establishes specific loading limits for contaminants of potential concern such as arsenic and mercury and testing and monitoring requirements. The use of the Cedar Bay FBC ash as a processing input in the manufacture of Class A biosolids from municipal sludge is regulated by the permit for the processing facility under Florida law, and the federal program under section 503 of the Clean Water Act. The latter limits the land application of sewage sludge, based on its constituents and quality. (PG&E00023)

With regard to the use of CCPs as a soil amendment, it is Dr. Daniels' and the states' experience that coal fly ash can be used both as an amendment for rocky mine soils and for direct revegetation of acidic coal wastes. In Dr. Daniels' words: "we have observed significant long term plant growth benefits from this practice, presumably due to enhanced water holding capacity along with improved availability of certain nutrients"(emphasis added). In using CCPs for these purposes, one must be cognizant of the salt content of the soil/ash mixture, particularly if there is salt-sensitive vegetation present. As Dr. Daniels points out, however, in Virginia all beneficially used CCPs must pass the Toxicity Characteristic Leaching Procedure (TCLP) and can only be applied in compliance with the state's "Regulation Governing Management of Coal Combustion By-Products" (VR 672-20-20, copy included with NMA comments in Attachment D) ... More specifically, under Virginia law, beneficial use of CCPs as soil amendments requires specific testing and approval of the CCP by the state Department of Agriculture and Consumer Services. The testing includes extensive total elemental and equilibrium extract testing, as well as a greenhouse bioassay using the appropriate soils and crops. Only then can the CCP be labeled and certified for such use. Nor is the experience of Dr. Daniels in Virginia unique. The state of West Virginia also has recognized, for decades, the beneficial use of CCPs as a soil amendment both for croplands and for mine reclamation. (NMA00024)

Since early 1995, we also have had a Cooperative Research and Development Agreement (CRADA) with the U. S. Department of Agriculture - Agricultural Research Service (USDA-ARS) on studying FGD by-products for agricultural use as "acid soilamendments". Our joint interest focused on how the low levels of magnesium in our FGD gypsum were found to improve soils for plant growth and deeper roots. They have had an on-going program in this area of beneficial uses of FGD by-product since 1978. For example, Docket index #SO162, Manual for Applying Fluidized Bed Combustion Residue to Agricultural Lands, was published in 1988. In that manual, arsenic was not even considered a possible pollutant in land application. The manual was updated in 1996 to include arsenic because of the 503 Rules for bio-solids included arsenic limits. However, the update was never released. Other docket entries described their work: S0155, S0156, S0158 and S0166. Currently, the USDA-ARS is writing more comprehensive guidelines for use of FGD products on agricultural land. They state many potential agricultural benefits can come from FGD by-products. (DTC00038)

The following documents, referenced in our original comments (copy enclosed) are enclosed:

- "Land Application Uses for Dry Flue Gas Desulfurization By-Products," a four-volume final report consisting of an Executive Summary and Phase 1, 2 and 3 Reports. This project was carried out by The Ohio State University and Dravo Lime Company, among others, and is OCDO Project D-89-35.
- Attachment 1 -These tables presents data from an on-going project entitled "Fluesorbent Injection By-product" (OCDO project D-95-18). This coal combustion product (CCP) results from the injection of a vermiculite-Ca(OH)<sub>2</sub> or perlite-Ca(OH)<sub>2</sub> sorbent into a flue gas stream for removal of SO<sub>2</sub>. Dr. Warren Dick of The Ohio State University's Ohio Agricultural Research and Development Center is carrying out this study, which is investigating the use of this CCP as a fertilizer on acid soils and soils low in sulfur fertility for alfalfa, corn, turf grass and soybeans. It has been found that fertilization with this CCP increased yields of alfalfa and turf grass, and had no effect on corn yields, Fertilization of soybeans is being studied this year. In Table 2 of this attachment, it is noted that the arsenic content of the CCP is higher than the arsenic content of agricultural limestone. The second table shows there is little difference between control soils and treated soils in the concentration of soil extracts. These data do not show any adverse environmental consequences from the use of Fluesorbent CCP as an agricultural fertilizer.
- Attachment 2 -This table presents data from 'Re-use of Clean Coal Technology By-products in the Construction of Impervious Liners" (OCDO project D-95-19) being conducted by Drs. Butalia and Wolfe of The Ohio State University. This project used CCP from the magnesium-enhanced lime FGD units at AEP's Conesville plant, to construct a liner for a hog manure lagoon. The data presented in the table show the trace metal content of the water above the liner in the pond, water in the sump beneath the liner, and water in a nearby well, over a period of about ten months, and prior to filling the lagoon with manure. In all cases, the arsenic content of water samples is below 0.035 ppm and of no environmental consequence.
- Attachment 3-These tables present data from "Product Development and Utilization of Zimmer Station Wet-FGD By-products," (OCDO project D-931-8) being conducted by the

Dravo Lime Company. Studies of this CCP used as a fertilizer on abandoned mine land (AML), on previously reclaimed mine land (RML) and on an acidic agricultural soil in Ashtabula County Ohio (AS) do not show any accumulations of arsenic in plant tissues. In Table 4 of Attachment 3, the arsenic content of the CCPs and limestone was less than 4 mg/kg in all cases. The remaining tables of Attachment 3 present plant tissue data from the three sites for one to two crop years. In all cases for both controls and treatments with CCPs, the arsenic content was less than 1.75 mg/kg and of no adverse environmental consequence. (ODOD00054)

[Attachments to comments include several scientific studies of agricultural use and risk assessment.] (PHS011)

To supplement our earlier comments, we refer to the peer-reviewed literature, particularly McMurphy, LM and Rayburn, AL (1993) and McMurphy, LM, et. al, (1996). These studies of the agricultural application of certain FFC wastes are included as Appendices to these comments. These researchers found ... [comment provides several pages summarizing this research]. (ALA00292)

## **VIII. AGRICULTURAL USE**

### **B. Flawed Risk Assessment Invalidates Conclusion**

Industry and academic commenters concluded that the non-groundwater human health risk assessment for land application as reported in the RTC was seriously flawed and therefore overstated risks. Specific concerns included EPA's estimates of typical amounts of arsenic in FFC waste, assumptions about the chemical form and availability of the arsenic, the potential exposure paths and time dependent concentrations, and comparisons of total and available arsenic in typical fly ash to common soils. These concerns are discussed further in Sections XIII, XIV, XVI, and XVIII, below. Some specific comments (see Section XVI below) attempted to quantify the magnitude of the overestimates and asserted that revisions to the study would demonstrate that beneficial uses do not present any risks and should not be subjected to any additional limitations by EPA.

Response: Based on these comments taken as a whole, EPA re-examined its key risk modeling assumptions. As discussed above in this section, EPA determined that one key factor used in the analysis was overly conservative. Accordingly, EPA now estimates risk from agricultural use of FFC waste at below the  $10^{-5}$  level. However, the entire question of arsenic toxicity is being reviewed, as also stated above. EPA notes that arsenic concentrations were provided to EPA by industry, as noted in response to general comments about data sufficiency.

**VIII. AGRICULTURAL USE**  
**B. Flawed Risk Assessment Invalidates Conclusion**  
**Verbatim Commenter Statements**

Overall, the risk predictions evaluated by USEPA seem to be overestimated for agricultural applications. Further, there is a need for a detailed study into the bio-availability of arsenic and its uptake by plants, animals, and human beings. The results of extensive laboratory and field data collected over the last two decades needs to be reviewed before coming to a conclusion on the potential risks associated with the use of CCBs. (OSU00015)

However, the relevant issue with respect to EPA's concerns expressed in the Report to Congress about As in agricultural applications may really be whether EPA's concerns are actually based on technically sound information. Information to the contrary was introduced at EPA's May 21, 1999, public hearing on the Report to Congress by two individual speakers from the USDA and from the University of Georgia (R. Chaney, and W.P. Miller, respectively, EPA Docket Number F-1 999-FF2P-FFFFF). Their comments primarily focused on the need to modify and/or correct various assumptions made by EPA in the Report to Congress about the typical amounts of As in CCPs, particularly in fly ash, the chemical form and availability of the As, the potential exposure paths and time-dependent concentrations, and comparisons of total and available As in typical fly ash to similar As levels in common soils. (ACAA00022)

PG&E Gen disagrees with the tentative option of subjecting practices involving the use of FBC wastes for agricultural purposes (i.e., as a soil nutrient supplement of other amendment) to some form of regulation under Subtitle C. This conclusion is not supported by the data presented, and is based principally on the unwarranted concern over arsenic risks, which are over-estimated by EPA's model. (PG&E00023)

As was made painfully evident at the May 21 public hearing, the agency's "more thorough" arsenic risk assessment is fatally flawed, and cannot support a conclusion that there is an unreasonable risk to human health or the environment posed by arsenic in the subject ashes. To grasp the scope of the flaws in the arsenic risk assessment, it is only necessary to recall the testimony of Dr. Rufus L. Cheney, Senior Research Agronomist at the United States Department of Agriculture at the May 21 EPA public hearing ... [the comment presents several pages summarizing the testimony] ... Considering all these errors in the agency's risk assessment, Dr. Cheney reached a well-founded conclusion that "...the Risk Assessment for arsenic in land-applied FFCB is so severely flawed that it is not a valid basis for public policy." (NMA00024)

In light of the wealth of expert testimony on the beneficial use of CCP (or FFCB or coal ash) as a soil amendment, the rigorous oversight of such uses by state governments, and the overwhelming number of fatal flaws in EPA's arsenic risk assessment, no reasonable basis exists for the imposition of RCRA Subtitle C hazardous waste rules on CCPs when used for agricultural purposes. (NMA00024)

The agency must re-examine and reverse its tentative conclusion to impose Subtitle C regulation on the beneficial use or disposal of CCPs for agricultural purposes and as minefill. EPA's arsenic risk assessment is so flawed it cannot support imposition of such regulations. (NMA00024)



EPA's risk assessment is overly conservative and does not support Subtitle C regulation of agricultural use of CCPs ... The risk assessment upon which EPA based its conclusion is seriously flawed through utilization of multiple unrealistic, overly conservative assumptions and provides no defensible foundation for a decision to pursue further regulation of this beneficial use of CCPs. Several significant assumptions used in the risk analysis are substantially more conservative than scientific research can justify. The overly conservative nature of several assumptions would each result in the overestimation of risk by an order of magnitude. When conservative values are chosen for most or all of the variables in the risk equation, the multiplicative effect generates excessive risk estimates that cannot approximate real world risk for even a minute percentage of the most vulnerable population. The conservative assumptions that undermine the accuracy of the risk assessment include the following ... [the comment provides several pages summarizing these concerns, see Topic XVI] ... These errors indicate EPA has over-predicted risk from agricultural applications of CCPs by orders of magnitude. This discussion has highlighted only some of the most significant errors. At the May 21, 1999 EPA public hearing, Dr. Chaney provided a careful critique of the risk assessment that identified additional significant flaws. (USWAG00037)

I believe that the risk assumptions made by EPA with respect to As in CCBs is flawed and egregiously conservative, causing unnecessary fears on the part of the public and potentially driving the power industry to costly disposal options. EPA was soundly criticized in early drafts of the 503 risk assessment for producing risk values that defied reality. The same is true with the CCB risk assessment for As. When the result of the assessment is a critical soil concentration that is well within the range of normal soil levels, then the agency has no other option but to critically reassess the assumptions in the risk model. In this regard, I strongly support the comments made on the risk assessment by my colleague, Dr. Rufus Chaney, USDA-ARS, with whom I worked on the 503 risk assessment. Dr. Chaney is one of the preeminent trace element biogeochemists in the world and his critique of the As risk assessment should be strongly heeded ... A reexamination by EPA of the As risk assessment will show that appropriate use of CCBs for waste treatment and as soil amendments is a wise use of these materials. (NVIC00039)

Although I do agree with others that the risk assessment was flawed, it would not be unreasonable for some sort of quality control to be applied for agricultural use as is the case for other fertilizers utilized in agriculture. Again, a regional approach would be preferable, considering the variables including local soil and hydrogeology, crops on which ash was used a soil amendment, and consideration for the widely varied chemical and mineralogical properties of FFC wastes. (EERC00044)

Another reviewer, specifically Dr. Rufus L. Chaney (USDA), has largely addressed ISG's concerns about methods for risk assessment. (ISG00048)

There are many more agricultural applications than EPA has considered. In fact, EPA has only considered direct field placement and not other applications such as agricultural uses on animal feedlots, municipal sludge, and in potting soil, where the suggested control of limestone arsenic quantification would not be appropriate ... When looking at the agricultural applications that EPA did consider, such as direct field placement, the modeling used did not truly evaluate existing agricultural practices. (CIBO00052)

While most of EPA's conclusions were based on sound science, NSP must address certain technical oversights which resulted in EPA's preliminary conclusion that agricultural uses of coal ash could result in arsenic exposure health risks. This letter will attempt to clarify those technical oversights by EPA which NSP believes will demonstrate that no such health risks reasonably exist. (NSP00057)

The underlying assumptions used in this risk analysis appear to be substantially more conservative than assumptions used in previous health risk analyses performed by the EPA for other materials. EPA must maintain a consistent, objective basis in evaluating health risks for the public; this draft RTC appears to subjectively identify risks that do not objectively exist. The EPA health risk analysis assumed questionable values for ash application rate, ash application frequency, ash arsenic concentrations, child ingestion rate, arsenic cancer slope factor & reference dose, and coal ash-arsenic bioavailability, as discussed below ... [the comment presents several pages documenting concerns with each of these inputs, see Topic XVI].

In summary, the conclusions presented by EPA on arsenic health risks for agricultural uses of coal ash were not based on sound science. To impose a higher standard on coal ash for health risk analyses compared to other EPA health risk analyses (i.e. EPA 503(b) Sludge Rules) is not fair to farmers or to industry. NSP and industry has extensive experience using coal ash in agriculture, and state regulatory agencies provide regulatory controls to protect human health and the environment. The purported risk "documented" in the EPA health risk analysis does not reasonably exist, and there is no justification for EPA to consider additional regulatory controls based on a flawed analysis. Until EPA corrects the flaws in the health risk analysis, those flawed conclusions will continue to undermine both EPA credibility and the state permitting process. (NSP00057)

We believe that the Agency should re-evaluate the risk assessment prepared for this report using the scientific information compiled by the USDA. We need to make sure that the science specifically developed about the suitability of recycling these by-products is appropriately evaluated and applied in order to make the best decisions about using these materials with demonstrated benefits to the environment. (BG00063)

I am concerned that a number of science issues have been handled inappropriately in the development of an approach to regulate fossil fuel combustion wastes (FFCW) ... These concerns include ... methods to estimate risks from arsenic and other trace elements applied to cropland in fossil fuel combustion byproducts ... and ... recent research and interpretation of research which might affect scientific risk assessment for soil arsenic and arsenic in land-applied byproducts including FFCW. (PHS011)

Any risk assessment is only as valid as the assumptions used in the calculations of exposure and risk. The risk assessment for beneficial use of these FFCB is replete with errors regarding application rate, fate of As in soil, bioavailability of soil As, amounts of soil ingested by children, etc. ... [the comment provides several pages summarizing each of these concerns, see Topic XVI]. (PHS011)

In conclusion, the Risk Assessment for As in land-applied FFCB is so severely flawed that it is not a valid basis for public policy. This report should be revised to correct these many identified

errors of EPA before it is submitted to Congress regardless of “due dates” for the report. Only bad policy can result from such a severely flawed Report. (PHS011)

Input variables for the oral cancer risk associated with land application of FFC wastes as soil amendments (lime substitutes) were assessed, and values used by RTI/EPA in their risk assessment of soil ingestion were found to result in substantial cancer risk to children in uncontaminated soils containing background As levels. Re-estimation of some of the input variables based on agronomic practices and pica behavior in children resulted in maximum safe As levels in the range of 37 to >300 ppm. In the authors opinion, the value of 41 ppm used in 40 CFR 503 for As in land-applied municipal sludge should be considered for land-applied FFC wastes. (PHS018)

In our initial comments, we explained that EPA’s agricultural use risk assessment is grossly inadequate to support a determination to impose restrictions on this beneficial use ... EPA used numerous assumptions in the risk assessment that are overly conservative and conflict with scientific research. (USWAG00275)

## **VIII. AGRICULTURAL USE**

### **C. Adequacy of Existing Regulations and Practices**

Many industry, academic, and state and federal agency commenters suggested that existing regulatory programs (e.g. under the U.S. Department of Agriculture and state regulations) and industry practices are adequate and appropriate to control risks associated with agricultural applications, and that additional federal involvement would be an unreasonable interference with state authority. One commenter specifically supported agricultural use when the applicable state agriculture department has determined it to be beneficial .

Response: While we have concluded that agricultural uses of fossil fuel combustion wastes do not pose significant risk, we believe that it is generally prudent to exercise oversight or guidance over the use of any type of wastes as agricultural amendment. Given the Agency's revised estimate of risk from agricultural application of FFC wastes, EPA generally agrees at this time that existing state regulations are adequate to control these risks. The Agency will continue to review and refine agricultural risk assessments for CKD and municipal sewage sludge proposals, as well as new scientific developments related to this issue, such as review of EPA MINTEQ model that was used as a component of our risk analysis, and as noted above monitor the continuing study of arsenic toxicity. If these efforts lead us to understand that risks posed by coal combustion wastes used for agricultural purposes may be higher than we have estimated here, we will take appropriate action to reevaluate today's regulatory determination. We would then also reconsider whether existing programs are adequate to control risks.

**VIII. AGRICULTURAL USE**  
**C. Adequacy of Existing Regulations and Practices**  
**Verbatim Commenter Statements**

For most states, the use of agricultural lime and fertilizer is regulated through the state's department of agriculture. For example, in the state of Ohio, this function is carried out by the Ohio Department of Agriculture. For CCBs, it would be prudent to have state EPA's regulate the agricultural uses with oversight from the state department of agriculture. The regulation of some CCBs for agricultural uses under Subtitle C, would result in unnecessary federal regulation of these materials, in spite of existing effective and less costly state mechanisms. (OSU00015)

OCDO's decade-plus experience indicates that when local conditions (soil type, hydrology, etc.) are taken into account and when the product is prepared (if necessary) and applied properly, it is possible to use CCPs successfully in an environmentally benign or beneficial manner, with no adverse environmental consequences. State regulatory bodies are in the best position to oversee this activity. (ODOD00017)

For these reasons, OCDO firmly believes that existing state regulatory bodies are in the best position to review and regulate local uses of CCPs. (ODOD00017)

A review of selected state regulations indicates that satisfactory procedures have been implemented at the state level under the authority of Subtitle D of RCRA for environmentally safe and technically sound uses of CCPs in agricultural applications. (ACAA00022)

The regulatory approaches used by the several states selected for review demonstrate not only that agricultural applications of CCPs are satisfactorily regulated at the state level, but also that further regulation at the federal level is not needed. (ACAA00022)

Clearly, all of the beneficial uses engaged in by PG&E Gen facilities with respect to beneficial use of FBC ash are currently regulated under multiple regulatory programs. These programs include appropriate site-specific permits designed to assess the appropriateness of the particular ash for the proposed use. They restrict and monitor any potential release of contaminants to the environment. (PG&E00023)

The management of these materials is adequately regulated through nutrient management and land application programs administered by USDA and pursuant to the Clean Water Act and by state programs. (p.3-74). (PG&E00023)

It is difficult to see the environmental benefit from prohibiting the recycling of this useful soil component in the production of biosolids which must meet rigorous chemical tests under federal law before they are available for use. The suggested alternative of establishing a maximum standard for agricultural use is already in place with respect to PG&E Gen's soil amendment uses in both Pennsylvania and Florida. EPA has not demonstrated that there is an absence of such standards in land applications of FBC ash. If such a standard is developed, it should take into consideration the considerable testing and monitoring evidence of low leachability from beneficial

use of these ash materials, rather than the theoretical health-based standard proposed in the Report. This theoretical standard is 200 times more stringent than the drinking water standard for arsenic. (PG&E00023)

In light of the wealth of expert testimony on the beneficial use of CCP (or FFCB or coal ash) as a soil amendment, the rigorous oversight of such uses by state governments, and the overwhelming number of fatal flaws in EPA's arsenic risk assessment, no reasonable basis exists for the imposition of RCRA Subtitle C hazardous waste rules on CCPs when used for agricultural purposes. (NMA00024)

States are adequately regulating the beneficial use and disposal of CCPs, including use for agricultural purposes and use and disposal in minefill. (NMA00024)

The WRAG would urge the Agency not to implement federal regulations under Subtitle C for agricultural or minefill applications of CCBs and believes that current local oversight adequately addresses the issues raised by the Agency. (WRAG00030)

A number of states have guidelines pertaining to the use of fertilizers and soil conditioners. The Virginia Department of Agriculture and Consumer Services has issued "Guidelines for Approving Industrial Co-Products For Agricultural Use Under the Virginia Fertilizer and Agricultural Liming Materials Laws." This document provides guidelines for approving a variety of industrial products in land use and contains maximum pollutant concentrations for a variety of elements, including arsenic. The State of Colorado's Department of Agriculture has issued two documents "Article 12 - Commercial Fertilizers and Soil Conditioners," and "Rules and Regulations Pertaining to Fertilizers, Soil Conditioners, Plant Amendments and Agricultural Liming Materials." Additionally, Colorado uses EPA's existing "Cumulative Loading Rates" taken from 40 CFR 50 and Canadian Cumulative Loading Rates for heavy metals in determining state approval of materials for agricultural fertilizers and amendments. These documents demonstrate that additional national guidelines that might be proposed by the Agency are unnecessary. (NCE00031)

EPA regulatory guidance may not be flexible enough to permit state and local agencies to approve these applications when site-specific situations pose little or no threat to public health or the environment. (NCE00031)

In conclusion, New Century Energies strongly believes that sufficient guidance is available at the state and local level pertaining to applications of CCBs in agricultural and minefill applications. (NCE00031)

Therefore, regulations on agricultural uses of CCPs should fall under some form of state or regional control based on the state or region's specific agricultural need or criteria. (BMT00032)

Furthermore, there is no regulatory void for EPA to fill. Existing regulatory controls are adequate to ensure protective agricultural application of CCPs. (USWAG00037)

Using their discretion, states have adopted a range of programs to suit their needs, ranging from range from agricultural product registration programs to regulatory programs based on the Canadian regulations or the EPA sewage sludge regulations, to elaborate permit programs. These

existing regulations provide a valid framework for ensuring protection of human health and the environment in agricultural applications of coal ash. State and federal authorities have thoroughly investigated the issue, enacted regulations appropriate to their state conditions, and remain actively engaged in research to promote the advancement of this beneficial use in a manner that is protective of human health and the environment. There is no lack of supporting scientific research. There is no need for EPA to take further action. (USWAG00037)

Based on its flawed risk analysis, EPA specifically suggested that potential Subtitle C regulation of agricultural uses of CCPs might restrict the arsenic content of CCPs to the level present in commercial lime products. An arsenic content restriction based on levels present in commercial lime is not justified. EPA has provided no support for such a federal restriction that would be an unreasonable interference with federal and State research and regulatory efforts. (USWAG00037)

We feel using the lower concentration level, i.e. that found in agricultural limestone as a standard limit would be too restrictive. Site specific controls would best be administered at the state government level, i.e. RCRA Subtitle D. (DTC00038)

States have the ability to develop effective landfill, mine reclamation, and agricultural programs. (ISG00048)

However, the Agency's RTC does not recognize, to any significant extent, the numerous states that allow the use of CCPs for use in agricultural application and their approval of methods for their use. (ISG00048)

CIBO disagrees with any suggestion that national regulation should supplant or duplicate State regulation, for sound policy and practical reasons. Controls should be site- and application-specific, as ash reuse is already governed by State regulation, and not through Subtitle C comprehensive federal regulation. Nor does CIBO believe that a voluntary program is necessary; as already stated, States have their own regulatory programs governing the use of ash and its disposal in minefills. (CIBO00052)

Various standards already exist for agricultural products to protect human health and the environment, and those standards are equally applicable for agricultural use of coal ash. US EPA standards for land application of sewage sludge in 40 CFR 5 503(b) provide an initial basis for such agricultural standards. (NSP00057)

In both cases, I believe EPA should look to the states for regulatory oversight of these activities, and, in fact, many states already have robust regulatory programs tailored to their local circumstances. (BCHRL0002)

In addition, state regulatory programs are demonstrably more than adequate to address any risks posed by the use and disposal of CCPs; the states have clearly recognized how beneficial the various uses including agricultural and minefill uses - can be. (WVDEPL0003)

Our efforts to beneficially use CFB ash began in 1989, when a program was developed with the California Regional Water Quality Board and the California Department of Food and Agriculture, to use the CFB coal ash as an agricultural mineral and liming agent. In more recent years the our

program has also been evaluated by the California Integrated Waste Management Board, the San Joaquin County Department of Health, and the U.S. Department of Agriculture's, Natural Resource Conservation Service and Agricultural Research Service. Our CFB coal ash is a California Department of Food and Agriculture registered agricultural mineral and has been successfully applied to thousands of acres of crop land for more than ten years. In the past three years we have begun to use Stockton's CFB coal ash for the construction of feedlot foundations. The CFB coal ash feedlot foundations have enabled livestock owners to significantly improve the management of concentrated animal feedlot runoff. The Natural Resource Conservation Service is currently in the process of approving the use of CFB coal ash under the Service's, Environmental Quality Improvement Program (EQIP). We have spent more than ten years and thousands of man-hours working with state and federal environmental and agricultural representatives in the development and evaluation of our programs to use CFB coal ash in agriculture. The programs have been both an environmental and agricultural success. (AIRP00270)

Air Products and Chemicals, Inc. believes that both California and Pennsylvania have ample and effective environmental management programs applicable to the use of CFB ash. (AIRP00270)

EPA has ignored the results of available scientific research and existing federal and state regulatory controls on agricultural applications. (USWAG00275)

As the General Manager of a waste coal -fueled electric generation station, the Gilberton Power Company, I believe that we have amply and effectively demonstrated the successful balance between economic issues and environmental concerns through adherence to the Pennsylvania regulations for CFB ash disposal and beneficial use and can see no benefit to the expansion of RCRA to include waste coal CFB ash and mixtures of coal ash with other fuel ash produced in a CFB. (GPC00297)

The PA State Department of Environment of Protection (DEP) comprehensively regulates the use of ash in reclamation and as soil amendments with no adverse impacts despite a decade of monitoring. (AMI00372)

As President and Owner of Amerikohl Mining, Inc., I believe that Pennsylvania has ample and effective waste disposal and management regulations already in place. (AMI00372)

The Company supports the utilization of coal combustion by-products for agricultural purposes when the applicable state agricultural department has concluded that the application is beneficial to human health and the environment based upon specific agricultural tests, compliance with agricultural regulations, or specific agency issued approvals. (VAP0042)



## **VIII. AGRICULTURAL USE**

### **D. Consistency with Other Programs**

Industry and academic commenters stated that it is unfair and inappropriate for EPA to propose arsenic limitations on FFC wastes that are significantly more stringent than those applicable to the materials the FFC wastes replace in this beneficial use application (e.g. municipal sludge under Part 503) or that would exceed arsenic levels in background soils. One of the commenters added that EPA should not regulate arsenic in FFC wastes when more important sources of human arsenic exposure go unregulated. Some of these commenters, along with a public interest group coalition, added that existing standards (e.g., the levels in potting soil, Part 503 biosolids regulations, Canadian regulations, etc.) for metals concentrations in waste-based soil amendments should be employed. One of the commenters insisted that, if restrictions are imposed, they should be consistent with EPA's Office of Pollution Prevention and Toxics' Background Report on Fertilizer Use, Contaminants and Regulations. Another commenter stated that, if restrictions are imposed, they should be based on testing and monitoring data on leachability from actual beneficial uses, rather than a theoretical health-based standard.

Response: If the Agency concludes that standards are warranted in the future as part of its broader review of agricultural application, such standards will be fully consistent with existing programs. As noted in the general response to this Section VIII, the Agency believes that it is inappropriate to establish an arsenic limitation for coal combustion ash when used for agricultural purposes that is equivalent to the contained in the EPA sewage sludge land application regulations. The organic nature of sewage sludge makes it behave very differently from inorganic wastes such as coal combustion waste.

**VIII. AGRICULTURAL USE**  
**D. Consistency with Other Programs**  
**Verbatim Commenter Statements**

It is our experience that the trace quantities of these nine elements in CCBs do not ever approach the limits outlined in 40 CFR 503. It then seems unnecessary to single out CCBs for possible regulation under Subtitle C if the trace elements do not approach or exceed limits already approved for sewage sludge. (NCE00031)

An arsenic content restriction based on levels present in commercial lime is not justified. EPA has provided no support for such a federal restriction that would be an unreasonable interference with federal and State research and regulatory efforts. Even if EPA's risk assessment conclusions were based on sound assumptions, they provide no basis for comparison with agricultural lime standards. Furthermore, the proposed approach would represent a higher degree of regulatory controls than EPA has imposed on other agricultural products with similar chemical constituents and agricultural uses. (USWAG00037)

EPA's proposed regulatory recommendations are also potentially in conflict with its own initiative to develop a comprehensive strategy for industrial waste management. (USWAG00037)

In January 1999, EPA's Office of Pollution Prevention and Toxics released a document titled Background Report on Fertilizer Use, Contaminants and Regulations, which contains a compilation of existing information on inorganic fertilizers and liming agents and addresses background information on fertilizer use, consumption patterns, composition and regulations. Unfortunately, neither the RTC nor the docket index refer to that document, which, despite its depth, represents only the beginning of a thorough study. The Fertilizer Report identifies numerous data gaps that must be addressed before further regulatory action is feasible. EPA's Office of Solid Wastes is in no position to recommend specific regulatory action when it has not yet digested and applied the data compiled by the Office of Pollution Prevention and Toxics. (USWAG00037)

The practice of subjecting FFC wastes to more stringent regulation standards than other comparable materials is difficult to justify. (EERC00044)

In fact, potting soil or even natural soil characteristics would be better references than limestone for making decisions about ash in soil substitution applications like agricultural and minefilling. (CIBO00052)

Various standards already exist for agricultural products to protect human health and the environment, and those standards are equally applicable for agricultural use of coal ash. US EPA standards for land application of sewage sludge in 40 CFR 503(b) provide an initial basis for such agricultural standards. (NSP00057)

Use of a market controlled application system, where the seller can only apply the quantity of FGDB required to replace a normal commercial application of limestone, based on the soil analysis of the limestone requirement of the soil, limits the application over time. The state regulatory agency could require that records of the evidence of lime requirement from a qualified

laboratory be held for inspection. And the generator has to monitor the composition and report this regularly to assure that changes in the quality or risk of the product is not changed substantially over time that a change in the permit would be required ... The composition and benefits of each FFCB would have to be evaluated to assure that the trace elements it contained would be safe in long term beneficial use before it were permitted in the way we described ... The discussion of “market controlled regulatory protections” noted above suggest that different approaches to regulation of FFCB might be even more in the public interest than the “prohibit” attitude endemic in the Report to Congress. (PHS011)

Much more important sources of human As exposure have not been considered for regulation by EPA, but most agree that the higher risk should be dealt with first. (PHS011)

Risk assessment for biosolids indicated that at least 41 mg As/kg biosolids was acceptable for beneficial use, and including bioavailability in the risk calculation would increase the allowed concentration significantly. (PHS011)

In the authors opinion, the value of 41 ppm used in 40 CFR 503 for As in land-applied municipal sewage sludge should be considered for land-applied FFC wastes. (PHS018)

As a result of these concerns and because we question whether use of these wastes for agricultural purposes can be termed beneficial, we recommended that EPA develop federal threshold standards for use of co-combustion coal wastes that mimics the effort the Agency has undertaken for land application of biosolids. (ALA00036)

In our research we have used the EPA 503 rules as a guide to plan our treatment rates. These rules were developed for biosolids which are highly organic in nature. The arsenic in CCBs is often tightly bound into a glassy or inorganic matrix and is not available for plant uptake or leachate. (OSU00046)

Land application of FFC wastes, particularly fly ash and bottom ash from coal combustion and oil wastes, should not be permitted. Land application of fluidized bed combustion waste material should not occur in the absence of federal oversight, anti arsenic concentrations in this waste should be limited to levels currently required FOR land application of sewage sludge. (ALA00292)

The suggested alternative of establishing a maximum standard for agricultural use is already in place with respect to PG&E Gen’s soil amendment uses in both Pennsylvania and Florida. EPA has not demonstrated that there is an absence of such standards in land applications of FBC ash. If such a standard is developed, it should take into consideration the considerable testing and monitoring evidence of low leachability from beneficial use of these ash materials, rather than the theoretical health-based standard proposed in the Report. This theoretical standard is 200 times more stringent than the drinking water standard for arsenic. (PG&E00023)

## **VIII. AGRICULTURAL USE**

### **E. Economic Impacts of Restricting Agricultural Use**

One industry commenter criticized the lack of consideration of economic impacts associated with limiting agricultural uses. Additionally, some commenters suggested that regulations and/or unfavorable classification of FFC wastes would be excessively costly, reinforce market barriers creating a disincentive for agricultural use, squelch any further research and development on agricultural use, or eliminate such beneficial uses altogether. One of these commenters argued that such a disincentive to recycling would be contrary to RCRA's statutory objectives.

Response: EPA's decision is to not regulate this practice at this time. If this determination is revised, for reasons noted above or for other reasons, economic impacts will be considered.

**VIII. AGRICULTURAL USE**  
**E. Economic Impacts of Restricting Agricultural Use**  
**Verbatim Commenter Statements**

EPA improperly disregarded the economic impacts of regulatory restrictions on the agricultural application of CCPs. Agricultural application is a beneficial use of CCPs with significant market potential ... EPA's decision to disregard the economic implications of its recommendations indicates a fundamental lack of appreciation of the value of this beneficial use for the electric utility industry as well as the agricultural community. (USWAG00037)

The market for agricultural utilization of CCPs presents significant potential. Years of research have reached maturity, and the market for this beneficial use is poised to expand significantly. Additional, unnecessary federal regulation will reinforce market barriers that will retard the growth of this important market and deprive farmers, the environment, and the utility industry of its benefits. Such action would be directly contrary to RCRA's statutory objective of promoting the conservation of natural resources and recovery of valuable materials from the country's wastestreams. (USWAG00037)

Imposition of Subtitle C hazardous waste rules would severely restrict, if not totally stop, such uses. CCP generators would have to seek new landfill capacity for these materials, thus increasing the greenfields impact. At the same time, agricultural and mining industry users would be forced to seek more expensive, but no more effective, "virgin" substitutes for these lost ash resources. Production of substitute virgin resources would again increase the greenfields impact. All of these results, and others, would occur without any net improvement in environmental protection; indeed, considering greenfields impacts and the loss of the value of these CCPs for agricultural and minefill purposes, society would suffer a clear net loss both environmentally and economically. (NMA00024)

In 1999, the regulation of agricultural applications of CCPs under Subtitle C, or some management system between Subtitle C and Subtitle D regulation, is not needed; and, such regulation would likely lead to the discontinuation of research, development and implementation of agricultural uses of CCPs. (ACAA00022)

A requirement allowing only CCPs which meet a certain criteria for As content to be used would be detrimental to the use of all CCPs. This would attach a stigma to CCPs and suggest that there is a problem. (ACAA00022)

I believe that the risk assumptions made by EPA with respect to As in CCBs is flawed and egregiously conservative, causing unnecessary fears on the part of the public and potentially driving the power industry to costly disposal options. (NVIC00039)

I have a concern with the tentative recommendation in the EPA report that agricultural and mine reclamation use of FFCWs be limited to those materials with As concentrations no higher than that found in agricultural lime. Such a restriction would severely limit, if not eliminate, any beneficial use of these materials as soil amendments. (PSU00040)

Further, waste minimization through ash reuse would be impeded with blanket regulations that would restrict certain applications unnecessarily. As EPA has found, many beneficial reuses of ash work to the protection of human health and the environment. Inappropriate use of Subtitle C RCRA authority can chill reuse and recycling programs, to both economic and environmental detriment. (CIBO00052)

PG&E Gen notes that serious consequences would result if agricultural amendments or minefilling activities were regulated under Subtitle C. Among these consequences are severe economic impacts, including the likely closure of several power generation facilities. (PG&E00274)

EPA has ignored the economic consequences of applying hazardous waste controls to agricultural use of FFC products, which would effectively kill this beneficial use option and bring to a halt scientific research on the issue. (USWAG00275)

Specifically, EPA determined that waste ash itself is exempt from regulation, yet the Agency is considering regulating its beneficial used in mine reclamation and agriculture amendments as hazardous waste. Regulating waste coal ash in this way would have far reaching effects on Pennsylvania's taxpayers and the state's environment. (PA00368)

## **VIII. AGRICULTURAL USE**

### **F. Benefits of Agricultural Use**

Some academic and state agency commenters stated that agricultural use (and specifically arsenic in FFC wastes) has no adverse environmental impact. Other industry commenters went on to state the potential benefits of agricultural application. One commenter suggested that FBC wastes are similar or superior to natural soils in terms of arsenic bioavailability and metals concentrations in general.

A public interest group commenter questioned the adequacy of EPA's evaluation of benefits of this practice. The commenter suggested that, in the absence of showing that crops actually grow better as a result of land application of these residuals, agricultural use would be land disposal rather than beneficial use.

Response: Based on its study of agricultural use in support of the Report to Congress, along with the information submitted by the commenters, the Agency generally agrees that agricultural application of FFC wastes can have beneficial effects under the appropriate conditions. This is reflected in the Agency's decision to not regulate at this time.

**VIII. AGRICULTURAL USE**  
**F. Benefits of Agricultural Use**  
**Verbatim Commenter Statements**

Using CCPs as soil amendments can provide several potential benefits including: addition of essential nutrients; neutralization of soil acidity; and improvement of moisture retention, infiltration, drainage, structure and soil tilth. These benefits are important to plant growth and production; and, they aid in the control of soil erosion by improving the physical and chemical conditions in the plant root zone. High-calcium CCPs have been used to improve the physical condition of soils in agricultural settings, by improving bearing capacity and resistance to drying, and for constructing dry areas for animal traffic and feed storage. (ACAA00022)

Probably the element that has received the greatest scrutiny, as related to agricultural and mineland reclamation uses of CCBs, is arsenic. We have conducted extensive study on the relationship between (1) the concentration of arsenic in CCBs (specifically clean coal CCBS) and (2) the relationship between the total loading of arsenic in CCBs and the uptake of arsenic into plants and movement into water coming from the CCB treated areas. I have attached summary tables of our work. This work can be summarized as follows:

1. Concentrations of arsenic in CCBs are generally slightly higher than those found in most soils in Ohio and in agricultural limestone.
2. Concentrations of arsenic in TCLP leachates (used to assess whether a material should be listed as hazardous or not) are much below the RCRA solid waste standard and sometimes even approach the drinking water standard.
3. Concentrations of arsenic in CCBs that are below the EPA 503 rules levels do not pose any significant uptake threat into alfalfa, a commonly used test crop.
4. Concentrations of arsenic in CCBs that are below the EPA 503 rules levels do not pose any significant threat to water quality. (OSU00046)

In our research we have used the EPA 503 rules as a guide to plan our treatment rates. These rules were developed for biosolids which are highly organic in nature. The arsenic in CCBs is often tightly bound into a glassy or inorganic matrix and is not available for plant uptake or leachate. (OSU00046)

NSP has completed substantial work which demonstrates that agricultural use of coal ash is beneficial without adverse impacts to human health and the environment. This work included extensive chemical characterization of coal ash, greenhouse testing in containers, pilot-scale field testing and full scale field testing. NSP had worked extensively with the University of Minnesota Agricultural Research Services, the USDA, the Minnesota Department of Agriculture and the Minnesota Department of Health, to establish the efficacy and safety for agricultural uses of coal ash. (NSP00057)

Results of these studies all demonstrate that beneficial use of coal ash when used in agronomic amounts leads to no adverse impacts on human health and the environment. NSP's Sherco 3 coal ash has significant liming capability, and it also contains agronomic quantities of sulfur, boron, and other nutrients. Market studies have shown that farmers will pay a premium for a coal ash product compared to quarried aglime because of the nutrient value in the coal ash. Crop productivity is



improved at a lower total cost to the farmer when he uses a coal ash liming fertilizer, instead of using aglime plus commercially available sulfur, boron, and other nutrients. This reduction in agricultural costs will result in an improved agricultural economy. (NSP00057)

Using coal ash in agriculture can also provide significant environmental benefits. Mining and production of other liming materials or fertilizers is reduced. A byproduct would be beneficially reused for its inherent nutrient value. The need for landfilling of coal ash would be reduced. Soil erosion would be reduced by allowing farmers to, for example, revitalize a 3 year old stand of alfalfa with a coal ash top-dressing instead of plowing that field down and planting a high intensity row crops such as corn. (NSP00057)

Our efforts to beneficially use CFB ash began in 1989, when a program was developed with the California Regional Water Quality Board and the California Department of Food and Agriculture, to use the CFB coal ash as an agricultural mineral and liming agent. In more recent years the our program has also been evaluated by the California Integrated Waste Management Board, the San Joaquin County Department of Health, and the U.S. Department of Agriculture's, Natural Resource Conservation Service and Agricultural Research Service. Our CFB coal ash is a California Department of Food and Agriculture registered agricultural mineral and has been successfully applied to thousands of acres of crop land for more than ten years. In the past three years we have begun to use Stockton's CFB coal ash for the construction of feedlot foundations. The CFB coal ash feedlot foundations have enabled livestock owners to significantly improve the management of concentrated animal feedlot runoff. The Natural Resource Conservation Service is currently in the process of approving the use of CFB coal ash under the Service's, Environmental Quality Improvement Program (EQIP). We have spent more than ten years and thousands of man-hours working with state and federal environmental and agricultural representatives in the development and evaluation of our programs to use CFB coal ash in agriculture. The programs have been both an environmental and agricultural success. (AIRP00270)

Use of FBC coal ash in soil amendments and mine reclamation is beneficial. (PG&E00274)

Our documented experience is that FBC coal ash, both chemically and physically, is the material of choice for soil amendment ... The high lime content naturally amends the soil, promoting vegetative growth as a soil amendment ... As shown in comments from ARIPPA and others, FBC coal ash has levels of metal and contaminants generally in the same range as native soils, according to the U.S. Geological Survey, but in a form and in an alkaline environment that makes trace metals less leachable than in soils. These beneficial uses are decidedly not waste disposal, but rather the productive use of the by-product because of its desirable characteristics as a land reclamation material. (PG&E00274)

Studies by the USDA with agricultural uses of FBC ash have shown that these materials do indeed provide valuable nutrients for plant growth. Use of FBC ash with high lime content improves the growing capacity of poor or acidic soils and increases the density of plant growth. Promotion of higher plant density reduces erosion and the transport of sediment to receiving streams. Ultimately, the use of this material reduces the amount of dissolved solids in the receiving stream. Additionally, these studies have shown that FBC ash actively limits phosphate from agricultural waters, diminishing downstream eutrophication potential. (PG&E00274)

The FBC ash may be used for its lime content and alkalinity which, when used as a soil amendment, can make it possible to achieve excellent revegetation results on sites where available soils are incapable of sustaining growth or where the cost of bringing in the amount of soil needed precludes reclamation. (PG&E00023)

Given this information, PG&E Gen believes it would be arbitrary and unwarranted to restrict the use of FBC ash in minefilling and soil amendments, and require costly unregulated soils to be utilized, which contain a similar level of arsenic, in what may well be a more bioavailable form than in FBC ash. (PG&E00023)

An important question to ask is: What benefits do these waste products offer? The term beneficial use must be used carefully and should mean that the waste product on its own provides some benefit. In the absence of showing that crops actually grow better as a result of land application of these residuals, a more appropriate term would be land disposal. (ALA00036)

**VIII. AGRICULTURAL USE**  
**G. Frequency of Damage Cases**

EPA did not identify any agricultural use damage cases in the RTC. An industry commenter noted this fact and emphasized that absent any evidence of damage EPA can not find that existing practices are inadequate and therefore warrant EPA involvement.

Response: EPA's decision is to not regulate this practice at this time.

**VIII. AGRICULTURAL USE**  
**G. Frequency of Damage Cases**  
**Verbatim Commenter Statements**

Furthermore, since none of these damage cases involve the beneficial use of CCPs, either for agricultural purposes or for minefill, there is no basis for even considering subjecting CCPs beneficially used for these purposes to Subtitle C regulation. (NMA00024)

The Report to Congress is devoid of damage cases addressing use of CCPs for agricultural purposes or minefill. (NMA00024)

## **VIII. AGRICULTURAL USE**

### **H. Clarification of Agricultural Use Definition**

Federal agency and academic commenters asked that any agricultural use proposal from EPA should include a definition of practices that are within the scope of proposed rule. One of the commenters noted that some applications of FFC wastes in agricultural operations (e.g. feedlot pads) are not contemplated in, and would not be reflected by the agriculture use scenario risk assessment. The commenter argued that such small-scale applications should not be included in agricultural uses subject to potential restrictions. A public interest group commenter requested that EPA's definition of agricultural use should explicitly distinguish beneficial use from land disposal and distinguish between those wastes that are suitable for land application and those that are not.

Response: EPA is not proposing any regulations for agricultural applications; therefore it is not necessary to further define "agricultural use" at this time. EPA agrees that, if this decision is re-visited, that various agricultural uses will need to be addressed separately.

**VIII. AGRICULTURAL USE**  
**H. Clarification of Definition of Agricultural Use**  
**Verbatim Commenter Statements**

A more precise detailed description of agricultural uses is necessary. (OSU00015)

It is not clear whether small-scale agricultural applications of CCW such as cattle feed lots and hay storage pads were viewed by EPA as "agricultural purposes (i.e., as a soil nutrient supplement or other amendment)" that would be subject to some form of Subtitle C regulation. Because the impact of such small-scale applications is negligible when considered on a farm-wide basis, DOE believes that such applications should not be considered by EPA as one of the "agricultural purposes" to which Subtitle C regulation would be applied. (DOE00020)

Commenters voiced concerns in the earlier round of comments about land application of co-managed FFC wastes for two primary reasons. First there are range of co-managed wastes, some of which are entirely unsuitable for land application. Second, even among those wastes that are suitable for land application, analyses included in the docket indicated that the range of heavy metals could make one batch of ash acceptable for land application but another batch unacceptable. For these reasons we requested that EPA distinguish between those wastes that were suitable for land application and those that are not. Additionally, it is EPA's role to explicitly distinguish beneficial use of wastes and land disposal of wastes. (ALA00292)

**VIII. AGRICULTURAL USE**  
**I. Coordination with Other Agencies**

Industry and federal government commenters stated that, if adopting any standards for agricultural applications, EPA should do so with the full concurrence of the Department of Agriculture. One of the commenters further stated that EPA should also draw on the expertise of recultivation experts in the Office of Surface Mining.

Response: If the Agency concludes that standards are warranted as part of its broader review of agricultural application, such standards, if and when proposed, will be fully coordinated.

**VIII. AGRICULTURAL USE**  
**I. Coordination with Other Agencies**  
**Verbatim Commenter Statements**

USWAG suggests that if, after a thorough review of the existing research, the Office of Solid Waste continues to believe agricultural application of CCPs represents a threat to the environment, the Agency should support a broad joint with the U.S. Department of Agriculture to develop a comprehensive and consistent approach to the agricultural application of waste derived products. (USWAG00037)

Similarly, in the case of agricultural uses, I think it would be extremely unwise for EPA to adopt Federal standards without the full concurrence of the Department of Agriculture that such regulations will not hurt the American farmer and are necessary to address a documented threat to human health that is not being adequately addressed by the states. (BCHRL0002)

Perhaps most troubling is EPA's apparent willingness to make regulatory decisions and issue public pronouncements on related agricultural risks with little or no consultation with the agency of government primarily responsible for agricultural issues (with little or no consultation even where there were no pressing statutory deadlines as there are in this proceeding.) (USWAG00275)

Now that the deadline for the regulatory determination has been extended to March 10, 2000, EPA should take advantage of the additional time to fully address this important issue and follow-up with USDA on its offer of assistance. EPA should conduct a thorough inter-agency review, drawing upon the expertise not only of USDA, but also of abandoned mine land reclamation and recultivation experts in the Office of Surface Mining. (USWAG00275)

However, since it appears unlikely that EPA will conduct a thorough inter-agency review of fertilizer issues in the context of a broad fertilizer rulemaking, it is ever more important for EPA to correctly address the issue in the specific waste decisions currently pending. (USWAG00275)



## **IX. DURATION OF COMMENT PERIOD**

EPA initially established a 45-day period after release of the Report to Congress during which interested parties could submit comments to the RCRA Docket for consideration by EPA in developing its final regulatory determination. A wide range of public interest groups, plus a few industry commenters, requested that EPA extend the comment period for the Report to Congress, arguing that the RTC and the supporting record were too voluminous and complicated to allow thorough review and comment in only 45 days. State government and industry commenters urged EPA to move forward with its regulatory determination and not extend the comment period.

Response: Because the Agency was initially subject to a court-approved consent decree to issue its regulatory determination by October 1, 1999, EPA was not immediately able to grant an extension of the comment period, since any extension would leave insufficient time for EPA to complete a regulatory determination by that date. However, the plaintiffs in *Gearhart versus Reilly* moved to modify the consent decree to allow EPA until March 10, 2000 to complete the regulatory determination to allow EPA to reopen the comment period. EPA supported this motion, and, on September 2, 1999, the Court granted the motion. EPA therefore reopened the comment period to extend until September 24, 1999. Based on the large number of comments received during the reopened comment period, the Agency believes the extended comment period was sufficient for all interested parties to complete their analysis and submit comments.

## **IX. DURATION OF COMMENT PERIOD**

### **Verbatim Commenter Statements**

Given the number of issues raised and the number of issues about which you are soliciting stakeholder input, the 45 comment period is not enough, especially with a public hearing in just over three weeks. It seems as if an extension is definitely needed in this case. (CATF00001)

The EPA has been obligated to produce this report for over 17 years, yet the public now has only 45 days to comment; we request that you extend the comment period for six months until November 1999 so our members will have time to evaluate the report and make comments. (WSERC00002)

Your Agency, in its April 28, 1999 Notice of Availability of the Report, announced a public comment deadline of June 14, 1999. The Report is, however, extremely technical, and the underlying record includes over 800 documents. We therefore, request an extension of time to comment on the Report and its draft recommendations. An additional six months would allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (OVEC00003)

The Report is, however, extremely technical, and the underlying record includes over 800 documents! We therefore respectfully request an extension of time to comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (NRCM00004)

The Report is, however, extremely technical, and the underlying record includes over 800 documents. We therefore respectfully request an extension of time to comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (LEAF00005)

The Report is, however, extremely technical, and the underlying record includes over 800 documents. We therefore respectfully request an extension of time to comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (IWLA00006)

The Report is, however, extremely technical, and the underlying record includes over 800 documents. We therefore respectfully request an extension of time to comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (TFEEE00007)

The Report is, however, extremely technical, and the underlying record includes over 800 documents. We therefore respectfully request an extension of time to comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (WVCAG00008)

Your agency only recently announced a public comment period ending on June 14, 1999, and since the report is extremely technical with volumes of underlying documents, we are requesting an extension of time to provide comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review of the Report by the environmental community. (CAAM00009)

The Report is, however, extremely technical, and the underlying record includes over 800 documents. We therefore respectfully request an extension of time to comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (EMEAC00010)

The Report is, however, extremely technical, and the underlying record includes over 800 documents. We therefore respectfully request an extension of time to comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (OA00011)

Your agency only recently announced a public comment period ending on June 14, 1999, and since the report is extremely technical with volumes of underlying documents, we are requesting an extension of time to provide comment on the Report and its draft recommendations. Specifically, we request an additional six months to allow for a meaningful review of the Report by the environmental community. (ALA00012)

The National Mining Association (NMA) requests that the deadline for commenting on the Report to Congress on Wastes from Combustion of Fossil Fuels (64 FR 22820) be extended for a period of two weeks to provide NMA and other affected parties the time necessary to compile and submit meaningful input. (NMA00013)

The Report is, however, extremely technical, and the underlying record includes over 800 documents. Clean Air Council therefore respectfully requests an extension of time to comment on the Report and its draft recommendations. Specifically, the Council requests an additional six months to allow for a meaningful review by the environmental community of the Report and the studies on which it relies. (CAC00014)

This is to request an extension of the comment period to respond to the EPA notice regarding the availability of EPA's Report to Congress on Fossil Fuel Combustion until July 2, 1999 ... The full Report to Congress is difficult to obtain (we ordered it from NTIS and have not received it as of this writing). As such, we have only the Executive Summary upon which to prepare comments. The technical basis for the recommendations is not provided in the Executive Summary so we cannot confirm or refute the Report's findings. Because this issue crosses over both environmental issues and energy issues, AF&PA has distributed the Executive Summary to industry experts in both fields. This additional coordination is necessary to assure that our industry's comments address all issues associated with wastes from fossil fuel combustion. Although EPA is under a consent decree to issue a regulatory determination by October 1, 1999, AF&PA believes that the additional weeks will not impinge on EPA's ability to meet that deadline. Furthermore, EPA's determination will be enhanced by public input. For all of the above-articulated reasons, we respectfully request an extension of the comment period. Please do not hesitate to contact me if you have any question on this issue. (AFPA00016)

The problems identified in these comments are the product of only a preliminary analysis of the Report to Congress, because the 45 day comment period provided was insufficient to conduct a complete review of the Report and the underlying data. For example, EDF was unable to address the adequacy of current state program requirements during the current comment period, or examine state files for additional damage cases. Nor did EDF review the non-groundwater risk assessments, or portions of the report regarding non-coal combustion wastes. It is our understanding that EPA intends to support an effort by the environmental plaintiffs (the Bull Run Coalition, an Oregon group) to modify the applicable Consent Decree and provide a four month extension of the comment period. EDF concurs such an extension is warranted, and would greatly benefit from such an extension. In this regard, EDF notes the industries generating fossil fuel combustion wastes have had years to selectively collect, assess and interpret the data, and discuss their implications with the Agency. Fairness dictates that EPA provide more than 45 days to other interested parties. (EDF00021)

We have formally requested the Agency to extend the period for written comments on this Report to allow us the opportunity to review it and the underlying analyses, documents, and appendices which the Agency claims support its draft Regulatory Determinations concerning the appropriate management and disposal of FFC wastes. As was expressed in oral comments before the Agency, a 45 day period to review a Report of this complexity is simply insufficient. The problem is compounded by the fact that the docket does not contain certain necessary supporting analyses and data apparently relied on by the Agency. Our experts have not had the time to date to conduct what we would consider a thorough or comprehensive review of the Report and its many underlying documents and appendices, particularly since their efforts have uncovered the fact that much necessary supporting information is not currently contained in the docket. Based on the review they have been able to complete in the 45-day period, we can provide some comments and, concerns about the Report and about the draft Regulatory Determination it contains. (ALA00036)

Certain of the analyses underlying EPA's conclusions and Regulatory Determination are not included in the docket, or have been withheld from public review, and also because the amount and complexity of material presented in the Report cannot be adequately reviewed in a mere 45-day period. It is notable that while only providing 45 days for public review of its analyses and decision, EPA is now 17 years past the statutory deadline for submittal of the Report on FFC Wastes to Congress. 42 U.S.C. §6982(n) (original deadline: October 21, 1982). It also is notable that EPA will have five months to review these public comments before it must finalize its Regulatory Determination under the terms of the consent decree currently governing this process. (ALA00036)

The Hoosier Environmental Council (HEC) and Citizens Coal Council (CCC) continue to strongly object to the outrageously condensed and grossly unfair period for public review and comment on the Executive Summary and Report to Congress regarding Wastes From the Combustion of Fossil Fuels, Volume 2. Nonetheless to establish a record of extensive objections that we have about these extremely biased documents, we will submit the following statement today. We plan to finish our comments and encourage comment from the public in a reopened public comment period. To facilitate such comments we request that EPA reopen the public comment period for this Determination for a five to six month period and hold public hearings with adequate notice (at least two months), in Indiana and other states where the lives of thousands of citizens will be profoundly affected by this Determination. (HEC00056)

Our testimony at the May 21 Public Hearing explained in detail why more time was needed than 45 days for the public to review and comment meaningfully on this Draft Regulatory Determination. To recap, we explained that the Report would have potentially far reaching adverse effects on tens of thousands of citizens who live in the vicinity of sites that are or may be used as dumping grounds for the wastes involved in this determination. We explained that these wastes include more than four fifths of all coal ash generated in the country, sludge generated from scrubbing coal fired emissions, any other fossil fuel wastes, many other wastes mixed with these wastes and wastes whose parent materials are coburned with coal. The Report could give a green light to states to allow all of these wastes to be dumped right into the drinking water of those citizens, and we explained that certain states, such as Indiana, are in fact attempting to legalize this practice on a widescale at this very moment. We explained that the public wants to have a meaningful say, as demonstrated by the more than 200 faxes that US EPA received from citizens and groups all over the country within a few days asking for a six month comment period. We explained that the Report and the Docket that supposedly supports it are extremely voluminous and noted that it has taken US EPA some 17 years beyond the original deadline in RCRA to produce this Draft Determination. (HEC00056)

While these costs and benefits may be explained somewhere in the 459 documents that comprise the Docket for this Report, the public is left to wade through this sea of paper to figure out where EPA could have come up with its conclusions about the unacceptable cost of Subtitle C. THAT TAKES FAR MORE TIME THAN 45 DAYS! (HEC00056)

Nowhere is Section 3004(x) or any other section of RCRA explained in this Report. This places an unreasonable burden on citizens living around potential disposal sites who are not professionals steeped in the nuances of RCRA which is a complex law implemented by voluminous technical regulations. To digest this Report and figure out what to say about its vague implications, they must first educate themselves from square one on RCRA and its provisions. THAT TAKES FAR MORE TIME THAN 45 DAYS! (HEC00056)

We explained that the Report is asking commenters to provide highly technical information. Regardless of whether such information can be produced in 45 days, the Report indicates EPA will make its final determination anyway on issues as fundamental as whether the federal government will condone the dumping of massive quantities of fossil fuel wastes directly into drinking water. For example, in Chapter 3, the Report concedes that, "the Agency currently lacks sufficient information with which to adequately assess the risk associated with this practice (minefilling)." It then asks commenters for "additional case studies of minefill situations, with the following types of information: minefill project design including areal extent, volumes, depth, environmental controls, mine spoils mixing ratio; characterization of combustion wastes that are involved; the background, pre-existing conditions in ground water at the mine location; and the depth to ground water at the mine location. The Agency is also interested in obtaining information on analytical modeling tools that can simulate fractured flow conditions and facilitate prediction of alkalinity consumption by acid mine drainage intrusion into the combustion wastes." This is a patently ridiculous request to make of anyone within the time frame provided other than a mining operation that is financially benefitting from a permit to dump fossil fuel wastes in its mine. EPA could not find this information in seventeen years of effort. The public will face an almost insurmountable obstacle course from obstinate, disinterested state bureaucrats, corporate "scientists" or the permit holders themselves that will prevent it from readily finding this information. Yet it is crucial for the Agency to obtain as much objective technical information as it can on this issue. THAT TAKES FAR MORE TIME THAN 45 DAYS! (HEC00056)

AF&PA (along with numerous other interested parties) requested an extension of the comment period because the complex Report requires careful review by the Association and its members. Moreover, a printed copy of Volume 2 of EPA's Report was available only from NTIS, which we received less than a week before the June 14, 1999 comment deadline. It is simply not possible to review this lengthy and complex document and prepare intelligent comments on it in less than a week. EPA's denial of the numerous requests for a comment deadline extension effectively denies the interested public of an opportunity to submit comments on the Report. The Agency's claim that a consent decree prevents it from granting an extension is not persuasive. EPA knew about the consent decree timetable and should have adjusted its own internal deadlines accordingly, instead of penalizing the public for the Agency's tardiness. (AFPA00061)

Therefore, we request that EPA reopen the comment period until all pertinent data have been compiled, all analytical tools employed, and a reasonable period of time is set aside for public inspection of these data. (OSM00283).

I ask that EPA adhere to its regulatory timetable and resolve this issue by October 1, 1999.  
(PA00045)

AEP takes exception to the stated claims of some entities that they have not been given a chance to assist in the regulatory process and that they do not have time to digest and comment on the Phase II Report. Industry has long been engaged in the process leading to the Phase II Report, and other entities have had the same opportunity. (AEP00060)

Finally, it has come to my attention that EPA published a notice in the June 10, 1999 Federal Register advising that EPA is seeking to negotiate an extension of the court-ordered deadline for completing the Bevill Amendment regulatory determination beyond October 1, 1999. Under both the statute (RCRA § 3001(b)(3)(C)) and the judicial deadline embodied in a Consent Decree, EPA has six months following the Report to Congress to receive public comment on the Report and to make a final regulatory determination. I fully understand that this is a relatively short time period, but Congress struck the balance in favor of a fairly expeditious process for both public comment and agency decision-making, and EPA should not be negotiating to thwart the statutory schedule when the Agency is already 16 years late in discharging its Bevill Amendment responsibilities. Any further delay would be unconscionable. (BCHRL0002)

## **X. SCOPE OF THE EXEMPTION**

EPA indicated that it considered the beneficial use conclusions to affect both Part 1 and Part 2 wastes. Some industry commenters found the extension of the scope to include Part 1 wastes inappropriate based on policy and legal grounds. One of these commenters specifically stated that EPA has previously recognized, and the court has affirmed, that Bevill determinations are “one-time” decisions that cannot be revisited. Some industry commenters also requested that EPA include certain wastes (e.g., combustion wastes from new technologies, comanaged chemical leaks and spills) within the scope of the exemption. Public interest group commenters supported the inclusion of Part 1 wastes based on precedent and stated that the distinction between Part 1 and 2 wastes was itself not consistent with previous policies or court decisions, essentially meaning that comanaged wastes should not be included within the Bevill Amendment (EDF00021, NCCLP00282). Industry commenters presented arguments rebutting this latter position (NMA00272, USWAG00275). Specific arguments raised in support of each of these positions are summarized below. One state government commenter was unclear as to whether EPA intended to include Part 1 wastes in the scope of its determination and requested a clearer definition in the final determination (IDNR00062).

Response: EPA believes it has the discretion and authority to revise its Part 1 determination, if it determines that to be appropriate, and that EPA’s prior position with regard to mineral processing wastes and the Solite decision are not to the contrary. Commenters who argued that EPA may not revise prior Bevill determinations in light of new information misunderstand the holding in Solite affirming EPA’s position that the Bevill Amendment requires only a “one time determination” that “would not be allowed to evolve over time.”

Solite only addresses whether EPA has an obligation under the Bevill Amendment to revise its regulatory determinations over time, by considering whether newly generated waste streams fall within the exemption. Industry argued that EPA was required to study newly generated waste streams (i.e., those that did not exist at the time of EPA’s regulatory determination) and exempt those that met the high-volume/low toxicity criteria. 54 Fed. Reg. at 36,595-96. The Solite court held that the statute did not require EPA to continually revise its regulatory determination over time in this manner. 952 F.2d at 491. This decision in no way purports to restrict EPA’s authority to revisit prior Bevill determinations based on new information or analyses.



## **X. SCOPE OF THE EXEMPTION**

### **Verbatim Commenter Statements**

There is no justification for re-opening of the 1993 Regulatory Determination's provisions affecting the use of CCPs for agricultural purposes. Moreover, EPA is barred by law from re-opening its earlier Regulatory Determination. (NMA00024)

Because state regulation of beneficial uses of CCPs, including use as minefill and for agricultural purposes, is sufficient to protect public health and the environment, EPA should not re-open the 1993 Regulatory Determination. (NMA00024)

Although EPA asserts that its 1999 Report to Congress in effect re-opens the 1993 regulatory determination on the use of CCPs for agricultural purposes, the agency has previously recognized in the case of mining and mineral processing industry wastes that regulatory determinations are "one-time" decisions that cannot be revisited. EPA cannot now reverse its earlier position, suggesting that it can reopen its Regulatory Determination. In 1989, the Agency proposed a rule on the management of mineral processing wastes as part of the Bevill process for mineral processing wastes. 54 FR 153 16 (April 17, 1989). In that proposed rule, EPA categorically rejected the idea of doing any further studies and reports to Congress on these wastes, asserting that "a one-time decision will serve to encourage rather than discourage environmentally sound mineral production and waste treatment process innovations" and provide industry with "substantial knowledge of the regulatory regime that it will face". 54 FR 15338. EPA maintained that position in the final rule. 54 FR 36592 (September 1, 1989). In *Solite Corn. v. EPA*, 952 F.2d 473 (D.C.Cir.1991), NMA and others challenged EPA's position that the Bevill Amendment required only a one-time study and regulatory determination. The federal Court of Appeals for the District of Columbia Circuit disagreed, however, and sided with the Agency. Citing its earlier opinion in *American Mining Congress v. EPA*, 907 F.2d 1179 (D.C.Cir. 1990), the Court held that "we clearly enough rejected the theory that Congress intended the coverage of the Bevill exclusion to evolve with time." *Solite*, 952 F.2d at 491. (NMA00024)

In the case of CCPs used for agricultural purposes, EPA now asserts that it can re-open its 1993 regulatory determination. In doing so, EPA is ignoring the position that it has repeatedly taken in rulemakings affecting Bevill Amendment regulatory determinations on mining and mineral processing wastes. Further, the agency ignores the position it took before the D.C Circuit in the *Solite* case, and turns its back on that Court's decision that a Bevill Amendment regulatory determination is a one-time matter. Just as the mining industry has been bound by EPA's 1986 and 1991 regulatory determinations, so also the utility industry, and those who beneficially use CCPs, have been bound by the 1993 regulatory determination on utility CCPs. EPA cannot reverse its course but instead must be held to its earlier (and correct) interpretation that RCRA requires a one-time study and report on wastes subject to the Bevill Amendment. (NMA00024)

MCC is concerned that EPA has taken results from “recent studies conducted by EPRI” demonstrating that “most utility operators comanage some or all of their large-volume wastes as they are actually managed “ as an opportunity to completely re-open the 1993 rulemaking on all combustion wastes. (MCC00051)

We believe regulations should not be passed directly based on co-mingling or co-management, but it must be done on the material constituents--not because it is a mixture. (MDCAL0001)

The comment has been made that EPA should reevaluate its 1993 determination with respect to coal ash practices. PG&E Gen disagrees with this assertion. The 1993 decision was a sound determination. Current coal ash management activities are adequately controlled by the state environmental programs and should remain exempt from hazardous waste regulations. The 1993 decision remains valid and supportable, and should not be reopened. (PG&E00274)

By stating explicitly in the regulatory determination that Orimulsion retains its eligibility for the Bevill exclusion and will be studied by EPA at such time as the waste is actually generated in the United States, EPA makes a modest contribution to promoting technological innovation in electric power generation simply by removing a regulatory ambiguity that could retard future use of this new fuel. (USWAG00037)

In short, given (i) the limited application of the 1993 regulatory determination in the real world, (ii) the limited risk assessment and damage case analysis conducted in support of that determination, and (iii) the additional damage cases on the risks posed by monofilled large-volume wastes, EPA should not shirk its obligations to protect human health and the environment by refusing to reevaluate the merits of its 1993 decision. (EDF00021)

EPA also indicated the low-volume wastes identified in the 1988 Report to Congress m within the scope of the exclusion when co-managed with large-volume wastes. This EPA interpretation was questionable at the time, since neither the EDF or Solite opinions directly or indirectly suggest mere co-management can expand the scope of the exclusion. (EDF00021)

Characterization of wastes should be required, and commingling of higher toxicity waste streams associated with coal combustion with higher volume wastes should be prohibited as improper treatment, or the entire resulting commingled waste stream should be considered hazardous. (NCCLP00282)

EPA should consider the low-volume, but potentially high-hazard FFC wastes that are currently co-mingled with high-volume FFC wastes, as separate waste streams potentially subject to Subtitle C regulation, rather than assuming future FFC waste co-management. (ALA00292)

The plain language of the Bevill Amendment, as well as its legislative history, clearly demonstrates that all co-managed wastes fall within the scope of that Amendment. In reauthorizing

RCRA in 1984, Congress ratified the long-standing interpretation that co-managed wastes are within the scope of the Bevill Amendment. Furthermore, judicial decisions fully support the inclusion of co-managed materials within the Bevill Amendment. (NMA00272)

It is unclear as to the intention of EPA with regard to considering some form of regulation under Subtitle C of only coal-fired utility comanaged wastes, non-utility CCW and FBC wastes or if EPA intends to apply this determination to all CCW including those that have been studied previously. The DoR suggests that EPA be very clear and concise as to what the recommendations resultant of this review are to ensure that it is quite clear as to what the recommendations apply. (IDNR00062)

DOE does not believe reconsideration of the 1993 regulatory determination is warranted with regard to the part 1 CCW used in minefilling applications. (DOE00020)

DOE also believes that EPA should not reconsider the part 1 wastes in this respect [agricultural use], as stated in Volume 1, Section 3, page 3-7. (DOE00020)

The purpose of this letter is to request that the U.S. Environmental Protection Agency (“EPA”) clarify in its final Report to Congress on Wastes from the Combustion of Fossil Fuels that the utility Bevill exclusion extends to leaks and spills of commercial chemical products listed in 40 C.F.R. § 261.33 that are co-managed with large-volume wastes. (G&KXXXX)

## **X. SCOPE OF THE EXEMPTION**

### **A. Precedent to Reopen based on Advances in Risk Assessment**

A public interest group commenter observed that the risk assessments performed for the current Report to Congress are more comprehensive than previous efforts and that it would be consistent with previous decisions to reopen the decision based on these advances. An industry commenter and a federal government commenter stated that the risk assessment was not more thorough and, therefore, reopening the decision was not warranted. The federal government commenter specifically addressed the risk assessment for minefills.

Response: EPA agrees with the general principle that wastes covered by the Part 1 and 2 determinations should be regulated in a similar fashion, given similarities between these wastes and the importance of ensuring consistent regulation across management scenarios so as to avoid confusion and uncertainty. As explained elsewhere, the Agency intends to apply the same regulatory approaches to both part 1 and part 2 wastes.

**X. SCOPE OF THE EXEMPTION**  
**A. Precedent to Reopen Based on Advances in Risk Assessment**  
**Verbatim Commenter Statements**

Given the flaws in the agency's current risk analysis, as demonstrated during the May 21 hearing and in comments on the Report, there is no new risk information that would support reopening the earlier Regulatory Determination. (NMA00024)

First, EPA correctly observes the risk assessments performed for the current Report to Congress are more comprehensive than the analogous effort for the 1988 Report to Congress and the subsequent regulatory determination. For example, the current Report to Congress reflects the consideration of non-groundwater exposure pathways, while the prior effort largely focused on the groundwater pathway. This shortcoming of the earlier work is particularly important since in this Report to Congress non-groundwater exposure pathways prove to be important, particularly when evaluating so-called beneficial uses. For other Bevill wastes, EPA has regarded similar advances in risk assessment procedures as grounds for reviewing prior regulatory determinations. (EDF00021)

Because EPA has not explained its reasons for reconsidering its 1993 regulatory determination pertinent to the part 1 CCW (fly ash, bottom ash, boiler slag, and flue gas cleaning wastes), DOE does not understand what pollutants are of concern to EPA. In its discussion of potential Subtitle C regulation of agricultural applications of utility co-managed wastes (Volume 1, page 3-7 and Volume 2, page 3-75), EPA justified its reconsideration of the part 1 wastes on the basis that (1) the part 1 wastes were identified as the source of the pollutant of concern (arsenic); and (2) EPA's current risk analysis for this practice (agricultural application) was more thorough than that conducted for the part 1 wastes originally. However, in its discussion of potential Subtitle C regulation of minefilling applications of utility co-managed wastes, EPA did not identify a specific pollutant(s) of concern, and did not conduct a more thorough risk analysis than was previously conducted for the part 1 wastes. Given the lack of these justifying factors, DOE does not believe reconsideration of the 1993 regulatory determination is warranted with regard to the part 1 CCW used in minefilling applications. It is worth noting that the portions of the EPA recommendations pertaining explicitly to minefill applications (Volume 1, page 3-7 and Volume 2, page 3-75) did not specifically mention the reconsideration of the part 1 wastes. (DOE00020)

**X. SCOPE OF THE EXEMPTION**  
**B. Precedent to Reopen Based on New Damages Cases**

A public interest group commenter suggested that the identification of new damage cases that appear to relate to CCWs managed alone justifies reopening the Part 1 decision. An industry commenter argued that none of these damage cases involved agricultural use or minefilling, and therefore they cannot be used to justify reopening the decision for these uses.

Response: EPA agrees with the general thrust of the comment that EPA should seek to regulate wastes covered by the part 1 and part 2 determinations in the same manner. EPA's evaluation of the damage cases is addressed elsewhere in this document.

**X. SCOPE OF THE EXEMPTION**  
**B. Precedent to Reopen Based on New Damage Cases**  
**Verbatim Commenter Statements**

The Report to Congress is devoid of damage cases addressing use of CCPs for agricultural purposes or minefill. As noted earlier in these comments, and as pointed out by USWAG testimony on May 21, EPA's six damage cases involve older, unlined utility CCP management units, not agricultural or minefill uses of CCPs. Thus, these six damage cases cannot possibly justify re-visiting an earlier Regulatory Determination. (NMA00024)

Even for sites involving the management of high volume coal combustion wastes alone, these new damage cases should call into question the previous regulatory determination based largely on a finding of damage at only "a very limited number of sites." (EDF00021)

Assuming arguendo the damage cases originated from the disposal of high volume CCW only, a significant number of additional damage cases not reflected in the earlier EPA study covering such wastes should cause EPA to revisit its earlier conclusion that the high-volume wastes when managed alone do not warrant regulation based upon their purported low-risk potential. (EDF00021)

## **X. SCOPE OF THE EXEMPTION**

### **C. Scope of Exclusion Too Broad, Given Precedent**

A public interest group commenter argued that EPA's position that comanaged wastes are within the scope of the exclusion is inconsistent with the Phase IV LDR rules and a Court of Appeals decision. Industry commenters disagreed with this argument, stating that the Bevill Amendment and its legislative history are clear that all comanaged wastes fall within the scope of the Bevill Amendment.

Response: EPA disagrees with the commenter's assertion that recent actions by EPA and the decision of the D.C. Circuit in the Horsehead Resource Development Company v. EPA, 16 F.3d 1246 (D.C.Cir. 1994), compels EPA to exclude from the scope of the Bevill exemption any small volume wastes that are co-managed with exempted FFC wastes. The commenter first asserts that EPA's recent amendments to the "mixture rule" applicable to mining and mineral processing wastes requires the Agency to exclude co-management of small-volume FFC wastes from the Bevill amendment. The commenter has apparently misunderstood EPA's recent revisions to the mixture rule. That rule addresses the mixture of Bevill-exempt wastes with non-exempt hazardous wastes. It in no way purports to address what kinds of wastes themselves qualify as Bevill wastes. As stated in EPA's regulatory determination for FFC wastes, the agency believes that certain small-volume wastes that are uniquely associated with exempt fossil fuel combustion wastes qualify as Bevill wastes. The mixture rule would not, and could not, have any effect on the Bevill status of wastes that EPA determines are themselves within the scope of the exemption. Moreover, application of the uniquely associated test ensures that FFC wastes do not, as commenter asserts, become unregulated dumping grounds for other hazardous wastes, since the exemption would only extend to wastes that satisfy the uniquely associated criteria.

Neither does the Horsehead decision address the issue here. That case merely found that the special waste concept was inherent in all the Bevill exempt wastes, including FFC wastes. It did not purport to restrict the Agency's discretion in deciding what wastes fall within the scope of the Bevill exemption. Consistent with EPA's longstanding interpretation of the Bevill exemption, EPA considers certain wastes to be exempt provided they are "uniquely associated" with the processes that enjoy Bevill-exempt status. EPA recently articulated criteria that it would apply this concept to mining and mineral processing wastes. 63 Fed. Reg. 28590-593 (May 26, 1998). Our regulatory determination for FFC wastes states that the Agency will follow these same criteria with regard to FFC wastes, and solicits comment on the proposed application of those criteria to certain low volume wastes that can be co-managed with FFC wastes. Therefore, EPA's approach here is entirely consistent with the Agency's current policies and practices with regard to other Bevill-exempt wastes. Finally, EPA believes that the commenter's arguments are inconsistent with the legislative history of the Bevill exemption as applied to FFC wastes, which expressly contemplated that it would apply to small-volume wastes produced in conjunction, and co-managed, with FFC wastes, provided there is not evidence of substantial environmental damage



from them. (See Congressional Record, February 20, 1980, p. H1102, H1104, remarks of Congressmen Bevill and Rahall).

**X. SCOPE OF THE EXEMPTION**  
**C. Scope of the Exclusion Too Broad, Given Precedent**  
**Verbatim Commenter Statements**

Based upon these decisions, EPA addressed the scope of the fossil fuel combustion waste exclusion in the 1993 regulatory determination. Specifically, EPA indicated that low volume wastes independently managed “are not and never have been within the scope of the exclusion.” However, EPA also indicated the low-volume wastes identified in the 1988 Report to Congress are within the scope of the exclusion when co-managed with large volume wastes. This EPA interpretation was questionable at the time, since neither the EDF or Solite opinions directly or indirectly suggest mere co-management can expand the scope of the exclusion. Indeed, EPA made no such distinctions for low-volume mineral processing wastes in the subsequent rulemakings mandated by the EDF Court. (EDF00021)

Perhaps more to the point, two post-1993 actions by EPA and the Court of Appeals compel EPA to revise its previous interpretation regarding the boundaries of the FFCW exclusion. First, EPA recently amended the Bevill mixture rule so that disposal units in which exempt high volume mining wastes and low-volume mineral processing wastes are co-managed would not be exempted and thus would be regulated under Subtitle C of RCRA.

EPA expressly rejected the co-disposal rationale for expanding the mining waste exclusion, so that “Bevill wastes not be allowed as an unregulated dumping ground for normal Subtitle C wastes”. (EDF00021)

Second, in *Horsehead Resource Development Company v. EPA*, 16 F.3d 1246 (D.C. Cir. 1994), the Court of Appeals expressly addressed the scope of the FFCW exclusion ... [comment quotes sections of the court’s decision] ... Therefore, under the holding in this post-1993 regulatory determination case, the Court applied the special waste limitation to the specific exclusion and wastes at issue in this Report to Congress. Moreover, as both the Court and EPA fully acknowledge, the special waste concept incorporates both high volume and low hazard eligibility criteria, and these criteria apply to wastes as they are generated since one of their purposes is to differentiate wastes amenable to Subtitle C management. Notwithstanding this clear and contrary Agency and judicial precedent, EPA apparently continues to adhere to its position articulated in the 1993 regulatory determination. EPA simply chooses to ignore the Horsehead opinion and Phase IV LDR rules as if they were never issued. (EDF00021)

Contrary to EDF’s allegations, D.C. Circuit case law supports the determination that all co-managed wastes are subject to the Bevill Amendment. EDF also argues in its comments that “two post-1993 actions by EPA and the [D.C. Circuit] Court of Appeals compel EPA to revise its previous interpretation regarding the boundaries of the FFCW [fossil fuel combustion waste] exclusion.” EDF Comments at 5 (emphasis in original). EDF seems to argue that EPA’s adoption in the “Phase IV” Rule of a mixture rule for mixtures of mineral processing wastes and Bevill

mining industry waste demands that EPA revisit the scope of the utility waste exclusion, 63 Fed. Reg. 28,596 (May, 26, 1998). EDF also alleges that the D.C. Circuit's decision in *Horsehead Resource Development Company v. EPA*, 16 F.3d 1246 (D.C. Cir. 1994), requires the same result. EDF is incorrect on both counts. The bottom line is that EDF overstates the scope of EPA's authority under RCRA. The threshold question under RCRA is whether the waste is a Bevill waste. If the answer under the Statute and its legislative history is "yes", EPA has no jurisdiction to decide the scope of the Bevill exclusion. As noted above, the legislative history and purpose of the Bevill Amendment are clear that by statute all co-managed wastes fall within the scope of the Bevill Amendment, i.e. they are all "special wastes." Nothing in the "Phase IV Rule" or *Horsehead* affects, or could affect, this Congressional determination. Accordingly, EPA lacks the authority to overturn the Congressional decision that all co-managed wastes are subject to the Bevill Amendment. (NMA00272)

Despite the fact that EPA has consistently adhered to this construction of the Bevill Amendment, the Environmental Defense Fund ("EDF") submitted comments that urged EPA to adopt a radically constricted interpretation of the amendment based on a misreading of three court decisions that explained the scope of the Bevill Amendment. The essential principal of those cases was established in *Environmental Defense Fund v. EPA*, 852 F.2d 1316 (D.C. Cir.1988) ("EDF"), which held that Congress intended the mining waste clause of the Bevill Amendment - specifically the ambiguous statutory phrase "'waste from . . . processing of ores and minerals'" (id. at 1327) - to "encapsulate the 'special waste' concept articulated by EPA in 1978 (id. at 1329). The effect of the decision, as later explained by the court, was to limit the Bevill exemption to 'only those mining wastes that would have fallen within the category of 'special wastes.'" *Horsehead Resource Development Co., Inc. v. Browner*, 16 F.3d 1246, 1255 (D.C. Cir.), cert. denied, 513 U.S. 816 (1994). See also *Solite Corp. v. EPA*, 952 F.2d 473,479 (D.C. Cir. 1991). It is true that those cases established the principle that the Bevill Amendment incorporates the "special waste" concept as defined in the proposed 1978 hazardous waste rules, but EDF fails to disclose that the courts interpretation of the mining waste clause was based in part on the conclusion that other Bevill waste categories - specifically utility wastes and cement kiln dust - were clearly "special wastes" and had been expressly identified as such by EPA in the 1978 proposal. See EDF, 852 F.2d at 1327 ("interpretation is reinforced by the fact that the other wastes singled out for exclusion in the Bevill Amendment are also large volume wastes, namely 'fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal and other fossil fuels'"). The court specifically referenced a table of "special wastes" in the 1978 proposal that classified utility wastes as a single waste category comprised of fly ash, bottom ash, and scrubber sludge with a total volume at the time of 66 million metric tons per year. Id. (citing 43 Fed. - Reg. 58946, 58992 (Dec. 18, 1978)). Plainly, that universe of utility wastes met the criteria of "special wastes" and constituted the baseline from which the court determined that the Bevill status of mining wastes was in doubt, which required a remand to EPA for resolution. (USWAG00275)

EDF also ignored the explicit congressional intent that the Bevill Amendment cover co-managed FFC wastes. As noted in our initial comments,” Rep. Bevill used the terms “fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels” to make clear that the Amendment extends broadly to the wastes actually generated by utilities that burn fossil fuel to generate electric power. Rep. Rahall was even more emphatic in noting that the wastes typically generated by utility power plants “do not include solely fly ash, bottom ash, slag, or scrubber sludge” but often include “materials which are mixed with these large volume wastestreams, with no environmental harmful effects, and often with considerable benefit . . . .” He provided the example of a mixture of boiler cleaning acids and alkaline fly ash to achieve neutralization. The point of the example is that co-management was typical of the way most utilities managed FFC wastes at the time the Bevill Amendment was enacted. EPA’s study of co-managed FFC wastes is consistent with this statutory mandate. (USWAG00275)

EDF is also in error when it claims that the recent amendment to the Bevill mixture rule “compel[s] EPA to revise its previous interpretation regarding the boundaries of the FFCW exclusion.” First, the Bevill mixture rule, by its terms, applies only to mining wastes excluded from the definition of hazardous waste under 40 C.F.R. § 261.4(b)(7) of EPA’s rules.” FFC wastes, on the other hand, are covered by 40 C.F.R. § 261.4(b)(4), not § 261.4(b)(7). Second, the preamble discussion of the Bevill mixture rule amendment was presented in the final Land Disposal Restrictions (“LDR”) Phase IV rule as part of the Agency’s resolution of “Issues Relating to Newly-Identified Mineral Processing Wastes.” Neither FFC wastes nor low volume wastes are “Newly-Identified Mineral Processing Wastes.” EPA characterized USWAG’s comments on the LDR Phase IV proposal as expressing concern “that the rhetoric contained in the preamble, while it does not apply to fossil fuel combustion wastes, might give the impression that EPA was modifying the entire scope of Bevill in the [Phase IV LDR] rulemaking, rather than addressing only mining and mineral processing wastes.” EPA responded emphatically, “Today’s rule does not in any way affect the RCRA Bevill regulatory status of wastes from the combustion of fossil fuels.” (USWAG00275)

The Bevill Amendment’s legislative history states unambiguously that the utility combustion waste clause covers co-management of FFC wastes. It would thwart the legislative purpose to remove the Bevill exclusion from mixtures of FFC wastes and low volume wastes, as EDF urges. (USWAG00275)

**X. SCOPE OF THE EXEMPTION**  
**D. Consideration of Low-Volume Waste Characteristics**

Public interest group commenters stated that EPA should consider low-volume wastes separately from large-volume wastes. One of these commenters specifically argued that EPA must perform the “high-volume” and “low-hazard” analyses for low-volume wastes to determine if they fall within the scope of the exemption. Industry commenters suggested that this position is based on a misunderstanding of EPA’s interpretation and argued that low-volume wastes are not themselves Bevill wastes, but an integral part of the way utility Bevill wastes are managed.

Response: As stated in the Phase IV LDR Rule, 63 Fed.Reg. 28591 (May 26, 1998), “The Agency assessed the impact of applying a high volume criteria to making uniquely associated determinations and found that such an application would make virtually all such wastes non-uniquely associated with mining and mineral processing. EPA does not believe that it would be appropriate to ignore altogether the extent to which a particular waste is associated with mining and mineral processing activities that are subject to the Bevill exclusion, since the exclusion on its face applies to wastes from these processes. In addition, the Agency believes that a certain degree of flexibility is needed for making uniquely associated determinations due to the complex and varied mineral operations and site specific factors that must be considered in making these decisions.”

After assessing fossil fuel combustion wastes, we find the same considerations apply. A large volume criteria would make virtually all such wastes non-uniquely associated, a result which is inconsistent with the legislative history, which recognized the exclusion of some small volume wastes when co-managed with fly ash, bottom ash, boiler slag, or flue gas desulfurization sludge.

**X. SCOPE OF THE EXEMPTION**  
**D. Consideration of Low-Volume Waste Characteristics**  
**Verbatim Commenter Statements**

EPA completely fails to address whether any or all of the low volume wastes are amenable to Subtitle C management. In short, the current Report to Congress contains remarkably little new information regarding the salient features of the low-volume wastes, notwithstanding EPA's prior concerns and the recognition ten years ago that additional information was required. To correct these deficiencies, EPA must perform the "high-volume" and "low-hazard" analyses necessary to delineate the appropriate boundaries of the fossil fuel combustion wastes irrespective of whether the wastes are co-managed. As consistently observed by both EPA and the Court of Appeals, these analyses are properly performed on a waste-specific, as-generated basis. (EDF00021)

The EPA Report and Boulding study indicate that the management of special wastes must be attuned to the variability of the concentrations of potentially toxic elements in the waste, and to the different problems presented by disposal sites, and by the type of special waste (i.e. FBC v. non-FBC wastes). The draft Report to Congress fails to clearly require characterization of individual waste streams prior to commingling, and the segregation in management of hazardous components of the waste stream; instead allowing dilution of those lower-volume, higher-toxicity components by co-disposal with lower-toxicity wastes (such as bottom ash). Characterization of wastes should be required, and commingling of higher toxicity waste streams associated with coal combustion with higher volume wastes should be prohibited as improper treatment, or the entire resulting commingled waste stream should be considered hazardous. (NCCLP00282)

EPA should consider the low-volume, but potentially high-hazard FFC wastes that are currently co-mingled with high-volume FFC wastes, as separate waste streams potentially subject to Subtitle C regulation, rather than assuming future FFC waste co-management. (ALA00292)

The present Report to Congress concerns all other fossil fuel combustion wastes – and pertains as well to the four previously permanently exempted waste categories insofar as they are co-managed with other waste streams from fossil fuel combustion. EPA reports that over 80 percent of the wastes from fossil fuel combustion are covered by the present Report, as current practice is primarily to co-mingle the waste streams for disposal purposes. EPA has chosen to evaluate these wastes for purposes of this Report to Congress as simply co-managed -- that is there has not been any rigorous attempt to segregate the component waste streams of the co-managed waste, and make a determination for each, based on its volume and toxicity. Instead the Agency simply assumes that industry can continue its practice of commingling these waste streams, effectively using the high volume lower hazard wastes to dilute the toxicity of low volume waste streams. (ALA00292)

In comments submitted on June 14, 1999 on the Report to Congress, the Environmental Defense Fund ("EDF") incorrectly asserts, among other things, that the Bevill exclusion from RCRA

Subtitle C regulation for wastes from the combustion of fossil fuels, RCRA Section 3001(b)(3)(4)(i). 42 U.S.C. 6 6921(b)(3)(A)(i), does not extend to coal-fired utility combustion wastes that are co-managed with fly ash, bottom ash, boiler slag and flue gas emission control wastes (“co-managed wastes”). Instead, EDF appears to argue that EPA should perform some type of “high-volume” and/or “low-hazard” analysis for co-managed wastes to determine if they are “Bevill Wastes.” EDF Comments at 8. EDF is wrong. RCRA, its legislative history, and the case law are clear that co-managed wastes are covered by and subject to the regulatory approach mandated by Congress in the Bevill Amendment. (NMA00272)

The Bevill Amendment and its legislative history are clear that all co-managed wastes fall within the scope of the Bevill Amendment ... Congress intended the Bevill Amendment to “be read broadly, to incorporate the waste products generated in the real world ,” 126 Cong. Rec. 3302 (1980) (remarks of Rep. Tom Bevill). In the real world, wastes generated by the utility industry often are co-managed, a fact noted with approval by the sponsors of the Bevill Amendment ... [commenter cites remarks of Rep. Nick Rahall] ... As demonstrated by Rep. Rahall’s example, the Bevill Amendment includes not only the Bevill wastes specifically enumerated in the Statute, but also these “other wastes” from the utility industry that are co-managed with them. Were it otherwise the “context specific” Bevill Amendment regulatory approach would not reflect real world management practices, and would be an empty gesture. EDF I, 852 F.2d at 13 14. (NMA00272)

Congress has directly spoken to the precise question at issue, i.e., whether co-managed wastes are covered by the Bevill Amendment. The legislative history and purpose of the Bevill Amendment demonstrate that the answer is “yes.” EDF’s allegation that co-managed wastes are not subject to the Bevill Amendment is contrary to the Statute. (NMA00272)

The 1984 Hazardous and Solid Waste Amendments Congressionally ratified EPA long-standing interpretation that all co-managed wastes fall within the scope of the Bevill Amendment. In January of 1981, shortly after the adoption of the Bevill Amendment, EPA addressed the very question raised by EDF in its 1999 comments, i.e. whether co-managed wastes fall within the scope of the Bevill Amendment. In a letter written by Gary N. Dietrich, then Associate Deputy Administrator for Solid Waste, to the utility industry, EPA correctly decided that co-managed wastes fell within the scope of the Bevill Amendment, based in part on the legislative history cited above. Since that time, EPA and the utility industry, have relied upon this EPA determination that co-managed wastes are subject to the Bevill Amendment. (NMA00272)

Between 1981 and 1984, neither EDF nor any other party raised any question or issue questioning the Bevill status of co-managed wastes. Faced with a consistent and uninterrupted interpretation regarding co-managed wastes, Congress amended RCRA in 1984, enacting the Hazardous and Solid Waste Amendments (“HSWA”), including section 3004(x) (also known as the “Simpson Amendment” after its sponsor, Senator Alan Simpson). Section 3004(x) was enacted because of Congressional concerns that certain new regulatory requirements mandated elsewhere in HSWA

would have serious economic impacts if applied to Bevill industry wastes ... [commenter quotes sections of the Simpson Amendment] ... The statutory description of the wastes covered by section 3004(s) – fly ash waste, bottom ash waste, slag waste, and flue gas – is identical to the language that appears in the 1980 Bevill Amendment, and is the precise language EPA in the Deitrich Letter had interpreted to include co-managed wastes. Statutes are constructed with reference to the circumstance existing at the time of passage ... when Congress adopts statutory language for which an agency has had a long-standing interpretation, it ratifies such an interpretation. *YLRB v. Bell Aerospace Co.*, 416 U.S. 267 (1974). Accordingly, Congress’s enactment of section 3004(x) of the 1984 HSWA ratified EPA’s long-standing interpretation under which co-managed wastes fall within the scope of the Bevill Amendment. (NMA00272)

EDF’s argument is evidently aimed at forcing EPA to revisit its long-standing interpretation of the Bevill Amendment as encompassing the four FFC waste streams named in the statute when co-managed with so-called “low volume wastes” by assuming that EPA has classified the low volume wastes as themselves constituting Bevill wastes and therefore requiring the low volume wastes to satisfy the ‘special waste’ criteria. But EDF has misunderstood EPA’s interpretation because the low volume wastes, most of which are not hazardous (2 RTC at 3-13 - 3-15), are not themselves Bevill wastes, but, as EPA found in the Report to Congress, they are an integral part of the way utility Bevill wastes are managed at roughly 80 percent of the utility industry’s combustion waste management units. See 1 RTC at 3-1; 2 RTC at 3-24. When in 1978 EPA estimated the volume of utility “special wastes” as 66 million metric tons per year, a large percentage of that universe was co-managed FFC waste. Given EPA’s statutory obligation to study utility FFC wastes as they are actually managed, EPA’s study of co-managed utility FFC wastes fully discharged that statutory requirement. (USWAG00275)

The Report to Congress shows that most low volume wastes co-managed with FFC wastes in fact are not hazardous wastes, and therefore the vast majority of co-management would not be affected by the Bevill mixture rule even if it were applicable to FFC wastes. And finally, the Report also demonstrates that none of the co-managed waste mixtures exhibited a hazardous characteristic even in those few cases where the low volume waste may have exhibited a characteristic as generated. Even the Bevill mixture rule, were it applicable to FFC wastes, would not apply to this situation because, by its terms, Subtitle C applies only if the mixture exhibits a hazardous characteristic. In sum, EDF’s argument for applying the Bevill mixture rule to co-managed FFC wastes should be firmly rejected. (USWAG00275)



## **X. SCOPE OF THE EXEMPTION**

### **E. Decision to Reopen Should Not Be Based on Comanagement Alone**

Two industry commenters expressed concern that the fact of comanagement alone does not warrant reopening the Part 1 determination. The commenters were concerned that no proportional relationship of comanagement is defined to delineate the level at which low-volume waste addition has any effect on the quality and environmental effects of the combined, comanaged waste. Any regulation of the material should be done on the basis of the material constituents and not on the fact that it is a mixture.

Response: The Agency believes, in light of today's regulatory determination, that revisiting the exemption of Part 1 wastes is unnecessary. However, the Agency intend that national Subtitle D regulations will also be applicable to Part 1 waste disposed in surface impoundments and landfills or used as fill in surface and underground mines so that all coal combustion wastes are consistently regulated across all waste management scenarios, for the following reasons:

- a. The co-managed coal combustion wastes that we studied extensively in making today's regulatory determination derive their characteristics largely from these large-volume wastes and not from the other wastes that are co-managed with them.
- b. We believe that the risks posed by the co-managed coal combustion wastes result principally from the large-volume wastes.
- c. These large-volume wastes, on a dry basis, account for over 20% of coal combustion wastes.

## **X. SCOPE OF THE EXEMPTION**

### **E. Decision to Reopen Should Not Be Based on Comanagement Alone** **Verbatim Commenter Statements**

MCC is concerned that EPA has taken results from “recent studies conducted by EPRI” demonstrating that “most utility operators comanage some or all of their large-volume wastes as they are actually managed “ as an opportunity to completely re-open the 1993 rulemaking on all combustion wastes. No proportional relationship of comanagement is specified or defined in the 1999 Report to delineate the level at which low-volume waste addition has any effect on the quality and environmental effects of the combined, comanaged waste. Any regulation of the material should be done on the basis of the material constituents and not on the fact that it is a mixture. (MCC00051)

We believe regulations should not be passed directly based on co-mingling or co-management, but it must be done on the material constituents--not because it is a mixture. Cement is as much of a mixture of combustion products as common salt is a mixture of two poisonous elements. (MDCAL0001)

**X. SCOPE OF THE EXEMPTION**  
**F. Inclusion of New Technologies in Scope of Exclusion**

One industry commenter asked that EPA explicitly state that Orimulsion is included in the scope of the exemption until such time as EPA has studied wastes from the combustion of this new fuel.

Response New technologies and fuels, such as orimulsion, are included in the scope of the exemption. We find no reason to treat new technologies differently. The expectation is that the nature of the waste is primarily driven by the nature of the fuel. In dealing with fluidized bed combustors, the Agency found the resultant coal combustion wastes were similar to coal combustion wastes from older combustion technologies.

Regarding new fuels, the current regulatory determination spans a broad array of fossil fuels, from gas to oil to coal. At this time, the only emerging fuel is orimulsion, which has properties somewhat between oil and coal. It seems reasonable that the nature of new fuels will have properties in the range of the fuels already addressed.

Given the expectation of similar wastes, the Agency is providing similar treatment. If a new technology or fuel emerges which for some reason has the potential to pose risks beyond those considered in today's regulatory determination, the Agency can re-open the determination for the new technology or fuel. Finally the Agency does not want to impede the development of new technologies or fuels due to differences in Bevil Status, especially where we have yet to identify the nature of the new technology or fuel and its potential impacts.

**X. SCOPE OF THE EXEMPTION**  
**F. Inclusion of New Technologies in Scope of Exclusion**  
**Verbatim Commenter Statements**

EPA should commit to undertaking a Bevill Study of the combustion wastes from Orimulsion at such time as a United States power plant converts to the combustion of Orimulsion to generate electric power. The RTC observes that some oil-fired utilities have considered burning a fuel produced in Venezuela known commercially as Orimulsion. This fuel is a mixture of bitumen and water, and performs in a manner similar to Fuel Oil No. 6. EPRI provided EPA with a brief report on the limited data available on Orimulsion combustion residuals, generally derived from a handful of power plants outside the United States that burn this new type of fuel. We understand EPA's reluctance to study the combustion residues of a new fuel where the data base is sparse and almost wholly from sources outside the United States. We believe it is only a matter of time before the combustion of Orimulsion becomes a viable option in the United States, and the circumstances that led Congress to direct EPA to undertake a Bevill study of conventional FFC wastes warrants the same conclusion for the wastes from the combustion of Orimulsion. By stating explicitly in the regulatory determination that Orimulsion retains its eligibility for the Bevill exclusion and will be studied by EPA at such time as the waste is actually generated in the United States, EPA makes a modest contribution to promoting technological innovation in electric power generation simply by removing a regulatory ambiguity that could retard future use of this new fuel. It also reaffirms EPA's commitment to setting regulatory policy for the combustion residues from fossil fuels - new fuels as well as the established ones - based on the eight study factors listed in section 8002(n) of RCRA. (USWAG00037)

## **X. SCOPE OF THE EXEMPTION**

### **G. Inclusion of Leaks and Spills in Scope of Exclusion**

A law firm requested that EPA clarify that the utility Bevill exclusion extends to leaks and spills of commercial products listed in 40 CFR Part 261.33 that are comanaged with large-volume wastes. The inclusion of leaks or spills of chemicals listed in 40 CFR Part 261.33 as low-volume wastes in the comanagement concept would avoid the unreasonable expense to segregate and separately manage such materials.

Response: The materials listed in 40 CFR Part 261.33 are listed hazardous wastes when they are discarded commercial chemical products, off-specification products, or container or spill residues, sometimes referred to as “P” and “U” wastes. While certain low volume and “uniquely associated” wastes may be subject to the RCRA Section 3001 (b) (3) (C) exemption, the P and U wastes are not uniquely associated with fossil fuel combustion and therefore not subject to the exemption.

Facilities that burn fossil fuels generate combustion wastes and also generate other wastes from processes that are related to the main fuel combustion processes. Often, as a general practice, facilities co-dispose these wastes with the large volume wastes that are subject to the RCRA Section 3001 (b) (3) (C) exemption. Examples of these related wastes are:

- C precipitation runoff from the coal storage piles at the facility.
- C waste coal or coal mill rejects that are not of sufficient quality to burn as fuel.
- C wastes from cleaning the boilers used to generate steam.

There are numerous wastes like these, collectively known as “low-volume” wastes. Further, when one of these low-volume wastes, during the course of its generation or normal handling at the facility, comes into contact with either fossil fuel (e.g., coal, oil) or fuel combustion waste (e.g., coal ash or oil ash) and it takes on at least some of the characteristics of the fuels or combustion wastes, we call it a “uniquely associated” waste. When uniquely associated wastes are co-managed with fossil fuel combustion wastes, they fall within the coverage of today’s regulatory determination. When managed separately, uniquely associated wastes are subject to regulation as hazardous waste if they are listed wastes or exhibit the characteristic of a hazardous waste (see 40 CFR 261.20 and 261.30, which specify when a solid waste is considered to be a hazardous waste).

The Agency recognizes that determining whether a particular waste is uniquely associated with fossil fuel combustion involves an evaluation of the specific facts of each case. In the Agency’s view, the following qualitative criteria should be used to make such determinations on a case-by-case basis:

- (1) Wastes from ancillary operations are not “uniquely associated” because they are not properly viewed as being “from” fossil fuel combustion.

- (1) In evaluating a waste from non-ancillary operations, one must consider the extent to which the waste originates or derives from the fossil fuels, the combustion process, or combustion residuals, and the extent to which these operations impart chemical characteristics to the waste.

The low-volume wastes that are not uniquely associated with fossil fuel combustion are not subject to today's regulatory determination. That is, they are not accorded an exemption from RCRA Subtitle C, whether or not they are co-managed with any of the exempted fossil fuel combustion wastes. Instead, they are subject to the RCRA characteristic standards and hazardous waste listings. The exemption applies to mixtures of an exempt waste with a non-hazardous waste, but when an exempt waste is mixed with a hazardous waste, the mixture is not exempt.

Based on the Agency's identification and review of low volume wastes associated with the combustion of fossil fuels, we are considering the following guidance concerning our views on which low volume wastes are uniquely associated with and which are not uniquely associated with fossil fuel combustion. Unless there are some unusual site-specific circumstances, we would generally consider that the following lists of low volume wastes are uniquely and non-uniquely associated wastes:

Uniquely Associated

- Coal Pile Runoff
- Coal Mill Rejects and Waste Coal
- Air Heater and Precipitator Washes
- Floor and Yard Drains and Sumps
- Wastewater Treatment Sludge
- Boiler Fireside Chemical Cleaning Wastes

Not Uniquely Associated

- Boiler Blowdown
- Cooling Tower Blowdown and Sludges
- Intake or Makeup Water Treatment and Regeneration Wastes
- Boiler Waterside Cleaning Wastes
- Laboratory Wastes
- General Construction and Demolition Debris
- General Maintenance Wastes

Moreover, we do not generally consider spillage or leakage of materials used in the processes that generate these non-uniquely associated wastes, such as boiler water treatment chemicals, to be uniquely associated wastes, even if they occur in close proximity to the fossil fuel wastes covered by this regulatory determination. Other industries that have leaks or spills from these same materials must manage these wastes as hazardous if they are listed or characteristically hazardous. The Bevill status was not intended so select industries could escape hazardous waste

requirements for wastes identical to other industries, thus the concept of uniquely associated. These spills and leaks will generally not be uniquely associated.

EPA solicits comment on this discussion of uniquely associated wastes in the context of fossil fuel combustion and will issue final guidance after reviewing and evaluating information we receive as a result of this request.

**X. SCOPE OF THE EXEMPTION**  
**G. Inclusion of Leaks and Spills in Scope of Exclusion**  
**Verbatim Commenter Statements**

The purpose of this letter is to request that the U.S. Environmental Protection Agency (“EPA”) clarify in its final Report to Congress on Wastes from the Combustion of Fossil Fuels that the utility Bevill exclusion extends to leaks and spills of commercial chemical products listed in 40 C.F.R. § 261.33 that are co-managed with large-volume wastes ... Chapter 3 (Volume 2, Section 3.1, page 3.3) provides that low-volume wastes include, among other things: “Floor and yard drains and sumps -- [defined as] wastewaters collected by drains and sumps, including precipitation runoff, piping and equipment leakage, and wash water” (emphasis added). This language would appear to include spills or leaks of commercial chemical products listed in 40 C.F.R. § 261.33 from piping and equipment used to support the combustion process. For instance, chemicals listed in 40 C.F.R. § 261.33 commonly are used at coal-fired utilities as chemical additives to treat water used in on-site boilers. (G&KXXXX)

The inclusion of spills or leaks of chemicals listed in 40 C.F.R. § 261.33 in the Bevill co-management concept also is consistent with the exemption from the mixture rule in 40 C.F.R. § 261.3(a)(2)(iv)(D) for leaks or spills of 40 C.F.R. § 261.33 chemicals that are mixed with wastewater that is subject to Clean Water Act regulation. The rationale behind the mixture rule exemption for leaks or spills of chemicals listed in 40 C.F.R. § 261.33 is that it would be unreasonably expensive to segregate and separately manage such leaks and spills. See 46 Fed. Reg. 56,586 (Nov. 17, 1981). In addition, the amount of such leaks and spills typically would be very small in relation to the total quantity of wastewater otherwise managed and would therefore not pose any type of hazard to human health or the environment. See *id.* These same considerations also are applicable to the co-management concept. The inclusion of leaks or spills of chemicals listed in 40 C.F.R. § 261.33 as low-volume wastes in the co-management concept would avoid the unreasonable expense to segregate and separately manage such materials. In addition, the amount of such leaks or spills clearly would be minor in relation to the amount of other low-volume wastes that would be typically be co-managed, and would be extremely minor in relation of the corresponding large-volume wastes. (G&KXXXX)

Based on the above discussion, and because the March 1999 Report does not specifically state whether the co-management concept would extend to spills or leaks of chemicals listed in 40 C.F.R. § 261.33, EPA should clarify in its final Report to Congress on Wastes from the Combustion of Fossil Fuels that the “floor and yard drains and sumps” low-volume waste category would include leaks and spills of chemicals, including chemicals listed in 40 C.F.R. § 261.33. (G&KXXXX)



## **XI. COMPLETENESS OF REPORT AND RECORD**

Various commenters criticized the completeness of the Report in that they were unable to find certain supporting information in the Docket or had concerns about the adequacy of peer review or stakeholder involvement. These concerns are summarized in more detail below.

Response: EPA believes that the Report and public record are substantially complete and sufficient to support its determination. EPA made specific efforts to assist commenters in finding information they requested during the comment period and supplemented the docket with additional information as necessary. The Agency further believes that peer review of certain analyses contained in the Report was adequate and performed by the appropriate persons. EPA believes that the Agency made sufficient efforts to invite both industry and environmental stakeholders to participate during development of the study, beginning in 1996. Given the court-ordered deadline for this rulemaking, it was not possible to transform draft documents into polished final documents. However, the draft documents provided in the docket provided the public an adequate opportunity to comment on the key information that was before the Agency. Moreover, EPA is also soliciting additional comment on certain aspects of our regulatory determination discussed in the FR notice. Specific concerns are addressed in more detail the sub-topic responses below.

## **XI. COMPLETENESS OF REPORT AND RECORD**

### **Verbatim Commenter Statements**

The conclusions offered in the coal waste study appear to be based on information that is not in final, tested form. (RICE00041)

The problem is compounded by the fact that the docket does not contain certain necessary supporting analyses and data apparently relied on by the Agency. (ALA00036)

Some of the data are not available to the public through the docket. For one database, there is only a cover sheet from an industry representative instructing the EPA project officer that the data are not to be released to the public. Almost nothing from the peer-reviewed literature has been incorporated into the analyses. (ALA00036)

The Report and background risk assessments were inadequately peer-reviewed. (ALA00036)

Contrary to EPA's assertions in the Report, the undersigned groups were not asked to participate in the process of developing this Report or its draft Regulatory Determinations as to whether co-managed FFC wastes should be regulated as hazardous wastes under Subtitle C of the Solid Waste Disposal Act/Resource Conservation and Recovery Act (SWDALRCRA). (ALA00036)

We explained that the Report makes basic assertions that are unsubstantiated or refuted by the evidence at hand. (HEC00056)

We request that EPA ... hold public hearings with adequate notice (at least two months), in Indiana and other states where the lives of thousands of citizens will be profoundly affected by this Determination ... EPA has ignored any outreach to the affected communities, much less early involvement. (HEC00056)

EPA's analysis suffers from poor documentation regarding analytical methods and information and data sources, and generally lacks bridges between assumptions and conclusions. (USWAG00275)

AEP takes exception to the stated claims of some entities that they have not been given a chance to assist in the regulatory process and that they do not have time to digest and comment on the Phase II Report. Industry has long been engaged in the process leading to the Phase II Report, and other entities have had the same opportunity. (AEP00060)

## **XI. COMPLETENESS OF REPORT AND RECORD**

### **A. Specific Information Not Provided**

Several commenters questioned the availability of certain analyses or pieces of information. Specific information purported to be missing is identified in the numbered items below, with specific responses to each item.

1. Adequate information on the costs of management alternatives was not available.

Response: Sufficient information on the costs of management alternatives was included in the docket in the Technical Background Document For The Report To Congress on Remaining Wastes From Fossil Fuel Combustion: Cost and Economic Impact Analysis.<sup>1</sup>

2. Summary information on sampling protocols validating characterization data was not available, specifically including the analytical data report and final report called for by the Quality Assurance Program Plan (QAPP).

Response: While information on sampling protocols was not summarized in the Report or Technical Background Documents, extensive information on these protocols is included in each of the studies from which characterization data were taken. These studies were included in the docket.<sup>2</sup> While it is true that the analytical data report and final data report were never completed, the Agency does not believe that these summary documents are necessary to validate the waste characterization results, given the extensive information on sampling protocols available in the individual site reports and EPA's own analysis of the sampling procedures which are available in the docket.

3. Concentrations upon which risks were based were not clearly identified.

Response: While the concentrations used in the risk analyses were not initially included in the docket, EPA provided this information directly to the commenter that requested it. This information is now included in the docket.<sup>3</sup>

4. Key descriptors of waste characteristics were not available.

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<sup>1</sup> FF2P-S0371. Technical Background Document for the Report to Congress on Remaining Wastes From Fossil Fuel Combustion: Cost and Economic Impact Analysis. EPA. March 30, 1999.

<sup>2</sup> e.g., FF2P-S0185; FF2P-S0186; FF2P-S0187; FF2P-S0188; FF2P-S0189; FF2P-S0190; FF2P-S0335; FF2P-S0336; FF2P-S0337; FF2P-S0338; FF2P-S0339; FF2P-S0340.

<sup>3</sup> FF2P-S0403. Memo: To Andrew Wittner, Re: Response to Margaret Round Questions of 5/12/99; FF2P-S0408. Memo: To Andrew Wittner, Re: Response to Margaret Round Questions of 8/30/99.

Response: Key descriptors of waste characteristics were included in the docket in the Technical Background Document for the Report to Congress on Remaining Wastes from Fossil Fuel Combustion: Waste Characterization.<sup>4</sup> In addition, EPA included in the docket an electronic file containing the individual data used to characterize FFC wastes for this study. This information was added to the docket in August 1999, prior to the re-opening of the comment period on the RTC.<sup>5</sup>

5. Presentation of the major components of risk assessment process was not complete and risk modeling results, data, and statistical distributions supporting the Monte Carlo analysis were not available.

Response: EPA believes that its presentation of the major components of risk assessment process (including the Monte Carlo analysis) in the Report and supporting documentation is complete and adequate. EPA further believes that its presentation of the modeling results is complete and adequate. This information is included in the docket in the Report itself, as well as in a number of supporting documents.<sup>6</sup> Additionally, EPA supplemented the docket with a compendium of the printouts from its risk assessment modeling exercises. This information was added to the docket in April 2000.

6. Data characterizing radionuclides and dioxins and furans were not available.

Response: In its discussion of radionuclides in the Report to Congress, EPA relied on radionuclide characterization performed in connection with other EPA programs. These characterization efforts are documented in publicly available sources cited in the Report to Congress.<sup>7,8,9</sup> EPA has further documented its consideration of radionuclides in *Review of Literature on Radionuclides in Fossil Fuel Combustion Waste* available in the docket. EPA's consideration of radionuclides is discussed further under Topic XIII.F.

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<sup>4</sup> FF2P-S0367. Technical Background Document for the Report to Congress on Remaining Wastes from Fossil Fuel Combustion: Waste Characterization. SAIC. March 15, 1999.

<sup>5</sup> FF2P-S0402. Coal Combustion By-Products and Low Volume Wastes Comanagement Data.

<sup>6</sup> e.g., FF2P-S0363, FF2P-S0370.

<sup>7</sup> Technical Background Supplement in Support of Rulemaking Adjustment Activities for Reportable Quantities (RQ) of Radionuclides. Final Draft. EPA, Office of Radiation Programs. February, 1989.

<sup>8</sup> Risk Assessments: Environmental Impact Statement for NESHAPs Radionuclides. Volume 2. EPA, Office of Radiation Programs. EPA-520/1-89-006-1. September, 1989.

<sup>9</sup> Estimate of Health Risks Associated with Radionuclide Emissions from Fossil-Fueled Steam Electric Generating Plants. EPA, Office of Radiation and Indoor Air. EPA/402/R-95/16. August, 1995.

For characterization of dioxins and furans in coal combustion wastes, EPA relied on the following source, which was included in the docket: PCDDs and PCDFs in Coal Combustion By-Products.<sup>10</sup> An additional source of data on dioxins and furans also included in the docket was: PCDDs and PCDFs in Coal Ash Samples for the Tennessee Valley Authority By-Product Marketing and Management.<sup>11</sup> EPA's consideration of dioxins and furans (along with other organics) is discussed further under Topic XIII.F.

7. Data and studies supporting the toxicity values used were not available.

Response: As discussed in the Report and supporting documentation, EPA based the toxicity values used in its risk assessment on publicly available data sources, including the IRIS and HEAST databases. Due to the size and scope of these databases, and their availability to the public, the Agency did not include them in the docket.

8. Characterization of low-volume wastes other than pyrites was not presented.

Response: Table 3-5 of the Report to Congress presents general characterization information for all types of low-volume waste. The Technical Background Document for the Report to Congress on Remaining Wastes from Fossil Fuel Combustion: Waste Characterization,<sup>12</sup> included in the rulemaking docket, provides the available characterization data for several types of low-volume wastes, including boiler blowdown, coal pile runoff, cooling tower blowdown, demineralizer regenerant, fireside washwater, boiler chemical cleaning waste, and mill rejects (pyrites). In light of the fact that this rulemaking applies to comanaged wastes, not low-volume wastes managed alone, EPA believes the degree to which the record characterizes low-volume wastes managed alone is adequate.

9. Discussion of the limitations of the characterization data was not presented.

Response: The adequacy of the characterization data, including information regarding the data's advantages and limitations, is discussed in detail in the responses under Topic XIII.

10. One commenter expressed concern that there was no connection between the data in the Waste Characterization Technical Background document and the data used in the risk assessments.

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<sup>10</sup> FF2P-S0333. PCDDs and PCDFs in Coal Combustion By-Products. EPRI. March 1, 1998.

<sup>11</sup> FF2P-S0239. PCDDs and PCDFs in Coal Ash Samples for the Tennessee Valley Authority By-Product Marketing and Management. KBK Enterprises, Inc. March 1, 1991.

<sup>12</sup> FF2P-S0367.

Response: The data presented in the Technical Background Document for the Report to Congress on Remaining Wastes from Fossil Fuel Combustion: Waste Characterization<sup>13</sup> were the source of the input concentrations used in the risk assessment. EPA apologizes for the extent to which this was unclear from the risk assessment and waste characterization documentation. EPA has since provided additional explanation of the input concentrations used in the risk assessment and included this information in the docket.<sup>14</sup>

11. One commenter was concerned that the discussion of the range of uncertainties in discussed in the risk Technical Background Document was not included in the Report to Congress itself.

Response: The discussion of uncertainties included in the Technical Background Document for the Supplemental Report to Congress on Remaining Fossil Fuel Combustion Wastes - Ground-water Pathway Human Health Risk Assessment<sup>15</sup> is far too extensive for verbatim inclusion in the Report to Congress. EPA, however, took into consideration all of the uncertainties described in the background document in its ultimate characterization of risk as presented in the Report to Congress.

12. One commenter was concerned that the revised Sensitivity Study report associated with the risk assessment is a draft, and the cover letter indicates that the work had been suspended pending funding and direction.

Response: Given the court-ordered deadline for this rulemaking, it was not possible to transform all draft documents into polished finals. Despite some documents being labeled as “draft,” the analyses conducted in support of this rulemaking as presented in the docket are substantially complete, including the sensitivity analyses conducted for the risk assessment.<sup>16</sup>

13. One commenter stated that there was no documentation of the sources of critical information in Table 2-5 of the Economic Background Document.

Response: The commenter’s concern regarding Table 2-5 of the Technical Background Document for the Report to Congress on Remaining Wastes From Fossil Fuel Combustion: Cost

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<sup>13</sup> FF2P-S0367.

<sup>14</sup> FF2P-S0403; FF2P-S0408.

<sup>15</sup> FF2P-S0363. Technical Background Document for the Supplemental Report to Congress on Remaining Fossil Fuel Combustion Wastes - Ground-water Pathway Human Health Risk Assessment. Revised Final Draft. SAIC. June 1, 1998.

<sup>16</sup> e.g., FF2P-S0361; FF2P-S0369.

and Economic Impact Analysis<sup>17</sup> appears to be related to a footnote that states “computed based on other assumptions.” This footnote intends to indicate that this value was computed based on the other assumptions that are specifically footnoted in the table. For example, if the net income before tax is 13 percent of revenues from electricity, the total baseline production cost can be computed to be 87 percent of revenues from electricity. Furthermore, if energy costs are 50 percent of revenues from electricity and interest expenses are 9 percent of revenues from electricity, operating expenses can be computed to be 28 percent of revenues from electricity, given that these three cost components sum to the total baseline production cost which is equal to 87 percent of revenues from electricity. The cost data in this table are relevant to utility operation and not power generation alone (see further discussion under Topic XXI.C below).

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<sup>17</sup> FF2P-S0371.

**XI. COMPLETENESS OF REPORT AND RECORD**  
**A. Specific Information Not Provided**  
**Verbatim Commenter Statements**

For example in Chapter 3, the Report dismisses the alternative of managing fossil fuel wastes generated by electric utilities as hazardous on cost grounds stating that “possibly all beneficial use practices and markets would cease.” and “The cost of compliance . . . could reduce the amount of coal consumed in favor of other fuels” and “the cost of generating electricity by burning coal could substantially increase.” Yet there are no discussions of requirements, estimates of cost, data, references or foot notes that would explain these basic assertions anywhere in the Report. (HEC00056)

EPA does not provide adequate information on the costs to plan, build, operate and close management alternatives. The key variables in EPA’s analysis of the incremental compliance cost associated with the implementation of Subtitle D requirements are:

- The number of affected plants and current management practices;
- Estimated waste generation quantities; and
- Costs of key components (in particular, treatment unit liners).

The RTC sections describing the cost and economic impact analyses, as well as the technical background document in the docket, do not adequately address the costs to plan, build, operate, and close the management unit alternatives for reducing arsenic risks. These alternatives (without cost data) are simply described in the risk alternatives section of the RTC. (DOE00020)

Our preliminary review of the Report indicates that EPA has neglected to provide a complete presentation of the major components of risk assessment process (i.e., hazard identification, exposure assessment, and dose-response assessment). Data are not available to understand how the human health risk assessment was conducted. Because risk assessment is an iterative process, the risk characterization and risk management analyses are also inadequate. Background documents, which were reviewed in an attempt to fill in the data gaps, were also found to be incomplete. (ALA00036)

However, summary information on sampling acquisition, frequency of detection, the detection limits, sampling locations and media, the sampling protocols representative of waste sites, quality assurance/quality control, background levels, or other information necessary to validate the FFC waste concentration data used in the Report was not provided by EPA. (ALA00036)



Tables in the Report with risk estimates for the groundwater and non-groundwater risk assessments did not contain the standard format that includes the concentrations upon which the risks are based. (ALA00036)

Tables in the Report provide summaries of the 50th and 95th percentile concentrations, but the key descriptors of exposure including the average, median, standard deviation, and upper bound on the average were not provided. Although the Technical Background Document for the Report on Remaining Wastes from FFC: Waste Characterization (March 15, 1999) contains a summary of the concentrations of constituents in FFC waste, there is no apparent connection between these data and the data used in the risk assessments. For example, EPA uses the 50th and 95th percentile concentrations as input to the model to predict groundwater concentrations in a hypothetical receptor well; however, the modeling results are not presented in the Report, appendices, or background documents. (ALA00036)

EPA relied on the finding of a probabilistic analysis (i.e. Monte Carlo analysis) to determine where the point risk estimates (i.e. deterministic results) fell within the distribution. EPA uses the Monte Carlo analysis to suggest that the point risk estimates are conservative and represent high-end scenarios (3-42). However, EPA does not provide any data to support the Monte Carlo analysis. A May 15, 1997 memo from Fred Hanson, Deputy Administrator of the EPA, provides the Agency's policy on the use of probabilistic techniques, including Monte Carlo analysis, in risk assessment. The policy states that the minimum conditions for acceptance of a Monte Carlo analysis requires that the: (1) purpose and scope of the assessment be clearly articulated, (2) methods for the analysis (including all models, all data upon which the assessment is based, and all assumptions that have a significant impact on the results) be documented and easily located in the report, (3) sensitivity analyses be presented and discussed in the report, and (4) information for each input and output distribution be provided in the report. None of these conditions are met even in the background groundwater risk assessment report from the EPA contractor. (ALA00036)

Data are not presented in the Report on the analyses of the concentration of organic compounds or radioactive-substances in FFC waste; however, EPA determined that no public health concern exists from these potentially toxic constituents. (ALA00036)

There is also an incomplete characterization of the dose-response assessment in the risk assessment of FFC waste. At a minimum, the overall database, and the critical study on which the toxicity value is based including the critical effect, uncertainty factors and modifying factors should be provided. EPA guidelines require that the dose-response assessment examine the quantitative relationships between exposure and effects in the studies used to identify and define effects of concern. No such analysis is in the Report, appendices, or background documents. (ALA00036)

The absence of toxicological profiles for health-based criteria used to estimate risks of FFC waste prevents any opportunity to comment on this critical risk assessment component. (ALA00036)

There were several points regarding the range of uncertainty in the groundwater risk assessment that were not discussed or considered by EPA in the analysis or risk characterization. For example, in the oil waste monofill scenario the contractor notes. "Risks may be understated by about 20 times. Units with larger areas have risks about 20 higher times that indicated here, due to the presence of an inflection point in model results at areas slightly larger than those modeled here." It was also noted that "Risks range from values given to half the values given based on the use of environmental location parameters ... Because it is difficult to suggest which is more appropriate a range." However, EPA did not present these ranges in the Report (SAIC, Oct 9, 1998 memo) (ALA00036)

EPA does not discuss the limitations of the waste characterization in assessing impacts, characterizing the risks, or making a Regulatory Determination. (ALA00036)

The QAPP also calls for an analytical data report, documenting the data summary, including a synopsis of the quality control, and also all the raw data to be delivered to SAIC personnel. This document could not be located in the docket. Finally, the QAPP requires a final report to the docket, containing the complete sampling and analytical report, including the quality assurance documentation, data validation documentation and analytical results. This document also could not be located in the docket, and many of the memoranda that discuss bits and pieces of this information remain in draft form. (ALA00292)

EPA did not provide toxicological profiles to evaluate the dose-response values used to calculate the hazard benchmark numbers (HBNs). (ALA00292)

EPA did not incorporate the range of uncertainties identified by the contractor that are associated with the environmental parameters (e.g. infiltration rate, hydraulic conductivity) used in the modeling analysis. (ALA00292)

As discussed in our initial comments, EPA has prominently displayed and integrated the results of the probabilistic analysis to support the finding that a high-end conservative analysis was conducted; however, no background information was provided to evaluate the analysis as required by Agency policies (EPA 1997) ... Therefore, we believe that if EPA continues to rely exclusively on a probabilistic analysis to support its findings it should at least provide the necessary information to assess the validity of the analysis. EPA policy requires that:

- (1) the purpose and scope of the assessment be clearly articulated in a "problem formulation: section that includes a full description of any highly exposed or highly susceptible sub populations evaluated (e.g. children).
- (2) the methods used for the analysis (including all model used, all data upon which the assessment is based, and all assumptions that have a significant impact upon the results) are to be documented and easily located in the report. This documentation is to include a discussion of the degree to which the data used are representative of the population under

- study. Also, this documentation is to include the names of the models and software used to generate the analysis. Sufficient information is to be provided to allow the results of the analysis to be independently reproduced.
- (3) the results of sensitivity analysis are to be presented and discussed in the report. Probabilistic techniques should be applied to the compounds, pathways, and factors of importance to the assessment, as determined by sensitivity analysis or other basic requirements of the assessment.
  - (4) information for each input and output distribution is to be provided in the report. This includes tabular and graphical representations of the distributions (e.g., probability density, function and cumulative distribution function plots) that indicate the location of any point estimates of interest (e.g., mean, median, 95<sup>th</sup> percentile).
  - (5) calculations of exposures and risks using deterministic (e.g., point estimates) methods are to be reported.

If EPA is unable to reconcile Agency policy regarding the use of probabilistic analysis it should be removed from the Report to Congress. (ALA00292)

Review of the draft RTC was especially complicated because the report nor its background documents did not provide all the information that was used by EPA's contractor in performing the health risk assessment. (NSP00057)

Nonetheless, in the current Report to Congress, waste contaminant concentrations on only one of the low-volume wastes are provided, namely coal mill rejects. For the remaining low-volume wastes, EPA merely provides brief summary descriptions of chemical content, and whether "one or more" samples of the wastes exhibited a hazardous waste characteristic. (EDF00021)

The Revised Sensitivity studies, for example, are particularly disturbing. The results, as far as they go, are very interesting and merit comparison with similar sensitivity tests such as those related to the Industrial Non-Hazardous studies. But that report is a draft, and the cover letter [SAI, 10/13/98] indicates that the work had been suspended pending funding and direction. (RICE00041)

One example suffices to demonstrate the inadequacy of the documentation and the spillover effect on the analysis: EPA presents a summary of its financial analysis conclusions for coal combustion in Table 2-5 of the Economic Background Document. There is no documentation of the sources of critical information in the table. (USWAG00275)

## **XI. COMPLETENESS OF REPORT AND RECORD**

### **B. Adequacy of Peer Review**

A public interest group commented that the report and background risk assessments were inadequately peer-reviewed. The commenter suggested the Agency should have the complete report peer reviewed, preferably by EPA's SAB and further expressed specific concern that the data characterizing dioxins and furans had not been peer reviewed. Another public interest group commenter expressed concern that SAB had not reviewed MINTEQA2, one of the elements of EPA's ground-water model.

Response: For the formal peer review of the risk assessment, EPA sought reviewers who are recognized experts in, or who have several peer reviewed publications or other written demonstration of expertise in any combination of the following areas: human health risks from exposure to contaminated ground-water, human health risks from exposure to contaminants via non-ground-water pathways, ecological risks from environmental contamination, and familiarity with fossil fuel combustion wastes. The four peer reviewers were: James Butler, Ph.D., Argonne National Lab, University of Chicago; Arthur Gregory, Ph.D., DABT Techto Enterprises; Anne Fairbrother, DVM, Ph.D., Ecological Planning and Toxicology, Inc.; and Carolyn Fordham Terra Technologies. The first two reviewers have expertise in human health risk assessment and the other two reviewers have expertise in ecological risk assessment.

In response to the comment urging a peer review of the entire Report to Congress, the RTC builds on technical and scientific analyses and proposes certain policy and regulatory positions that are most appropriately released for comment in the broad arena of public policy debate, as the Agency did, in accordance with the statutory directive of RCRA section 3001 (b) (3) (C).

## **XI. COMPLETENESS OF REPORT AND RECORD**

### **B. Adequacy of Peer Review**

#### **Verbatim Commenter Statements**

EPA states on page 3-13 of the Executive Summary that “although an exhaustive review of the organics data has not been conducted, based on available information; total and leachable organics are generally reported to be at or below analytical detection limits.” EPA references two studies from 1987 and 1982. However, the Technical Background Document for the Report to Congress on Remaining Wastes from FFC: Waste Characterization (March 15, 1999) indicates that more recent analysis have been provided to EPA but not considered in the Report. For example, page 2-10 of the Technical Support Document states: “In addition, data characterizing dioxins and furans in comanaged wastes are available from an EPRI (1998) study. This study analyzed samples from 11 disposal sites for 17 polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) that are currently considered to be of toxicological significance. Fifteen samples were taken, two of which were analyzed twice for a total of 17 analyses. This data are not referenced or discussed in the Report or background risk assessment documents. It should also be noted that the peer reviewers were not provided this data to review, and at least one reviewer noted this in their comments (Butler, 1998). (ALA00036)

The Report and background risk assessments were inadequately peer-reviewed ... The Agency states that as part of the risk assessment process for this study, two peer reviewers reviewed the multipathway assessment and two peer reviewers reviewed the ecological assessment. This level of review is completely inadequate for a report of this magnitude, especially one that contains a Regulatory Determination. The Agency should have the complete report peer reviewed, including the conclusions derived from the various analyses, by a panel of independent scientists. The preferable review panel would be EPA’s Science Advisory Board (SAB). There is ample precedence for the Agency to have a Report to Congress extensively peer-reviewed. Recent examples include the Residual Risk Report, The Utility Air Toxics Study, and the Mercury Study Report to Congress. Despite the fact that the Mercury Study did not contain a Regulatory Determination and had gone through extensive peer review, the White House Office of Science Technology (OSTP) protested the “minimal peer review” and the Report was subsequently vetted by the SAB prior its release. (ALA00036)

In fact, MINTEQA2 was expressly not evaluated, and SAB indicated “the accuracy of the model estimates must be verified and the documentation of this use needs to be clarified.” Therefore, SAB has not reviewed one of the most crucial components of EPA's groundwater modeling underlying the Report to Congress. (EDF00021)

**XI. COMPLETENESS OF REPORT AND RECORD**  
**C. Adequacy of Agency Solicitation of Stakeholder Involvement**

Public interest groups indicated that, contrary to EPA's assertions in the Report, the commenters were not asked to participate in the process of developing the Report. One of the commenters stated that EPA's public hearings were not conveniently located for all affected parties to express their concerns. A number of citizen and public interest group commenters requested that EPA hold public hearings in the states or regions affected by CCW disposal. One industry commenter took exception to the claim that some commenters did not have the opportunity to participate.

Response: Beginning in 1996, EPA invited industry, public interest and other stakeholder groups to participate during the conduct of this study. Two environmental groups, the Environmental Defense Fund (EDF) and the Hoosier Environmental Council (HEC) did so. Both EDF and HEC were explicitly asked to invite all interested parties in their stakeholder group. The Agency believes that reasonable opportunities were offered to public interest stakeholders to participate during development of the study and during the public comment period. Because of the time constraints of the court schedule under which EPA was operating to conduct the study, the Agency had to limit the number of public hearings to just one.

The RTC was issued on March 31, 1999 and the April 28 Federal Register notice provided a 45 day public comment period, until June 14, 1999. The Agency held a public hearing on May 21, 1999 in Washington DC. We regret that we were not able to provide 60 days notice in advance of the meeting, however we were obligated by a court-ordered deadline to issue our final determination by October 1, 1999. In response to commenters who stated that the Agency should have held hearings in states affected by coal combustion waste disposal, we were constrained by our court-ordered deadline and by resource limitations from holding a series of meetings. We believe that by conducting the public meeting in Washington DC we provided a reasonable location to accommodate the broad range of stakeholders who have an interest in this determination.

**XI. COMPLETENESS OF REPORT AND RECORD**  
**C. Adequacy of Agency Solicitation of Stakeholder Involvement**  
**Verbatim Commenter Statements**

Contrary to EPA's assertions in the Report, the undersigned groups were not asked to participate in the process of developing this Report or its draft Regulatory Determinations as to whether co-managed FFC wastes should be regulated as hazardous wastes under Subtitle C of the Solid Waste Disposal Act/Resource Conservation and Recovery Act (SWDALRCRA). (ALA00036)

We request that EPA ... hold public hearings with adequate notice (at least two months), in Indiana and other states where the lives of thousands of citizens will be profoundly affected by this Determination. (HEC00056)

EPA has spent 17 years coming up with this report but we're still waiting for its "outreach and communication." "Partnership" with EPA is out of the question until agency officials start understanding the history and current situation in the coalfields. (HEC00056)

EPA has ignored any outreach to the affected communities, much less early involvement. Indeed, the following examples show that EPA officials apparently have no respect for our communities, only contempt ...

- The one field trip by EPA that we're aware of took place after the draft report was issued and involved state officials and industry representatives. To date, EPA has ignored our requests to meet with the people affected by CCW dumping ...
- EPA's one hearing, in Washington D.C., was hundreds of miles from the communities where CCW is being dumped. Airfare and accommodations were so expensive, we could send only one representative to testify. Apparently, EPA set the location for the convenience of the agency officials and well-heeled utility industry lobbyists, and discounted the needs of our community residents.(HEC00056)

EPA should hold public hearings in states affected by CCW disposal, including Texas. (CITZ00256)

EPA should hold public hearings in states affected by CCW disposal. (VWI00258)

The EPA must ... hold public hearings in states affected by CCW disposal. (CITZ00260)

EPA should hold public hearings in states (and communities therein)affected by CCW disposal. Contrary to the method used to collect data for the report to Congress, THE EPA IS SUPPOSED TO EXERCISE REGULATORY OVERSITE OVER THE INDUSTRY ON BEHALF OF CITIZENS. (CITZ00261)

EPA should hold public hearings in states affected by CCW disposal. (CITZ00263)

EPA should hold public hearings in states affected by CCW disposal. (CITZ00264)

The public should be offered a chance to comment on CCW disposal by the availability of hearings in all affected states. (CITZ00267)

EPA should hold public hearings in states affected by CCW disposal. (SIERRA00278)

EPA should hold public hearing in states affected by CCW Disposal. (SOCM00279)

EPA should hold public hearings in states affected by CCW disposal. (CITZ00284)

Hold public hearings in states affected by CCW disposal. (CITZ00291)

Tri-State is asking the EPA to hold public hearings in all states affected by CCW in order to supplement the process of gathering technical data. (TRI00295)

We urge you to go into the communities and talk with watershed groups and citizen groups about these issues--to rely so heavily on industry's assessments is unbalanced, unscientific, and unwise. (PEACE00306)

EPA should hold public hearings in states affected by CCW disposal. (CITZ00326)

Justice would seem to require that those most impacted by these decisions, those on the land where CCW would be deposited, who will be drinking (or be unable to drink) that groundwater have an opportunity to be heard at public hearings. (CITZ00335)

I urge the EPA hold public hearings in states that will be affected by Coal Combustion Wastes. (CITZ00337)

EPA should hold public hearings in all states affected by coal combustion waste disposal. (CITZ00346)

EPA should hold public hearings in states affected by CCW disposal. The concerns of citizens whose water resources are impacted by CCW dumping must be the highest consideration by EPA. (CITZ00349)

EPA should ensure the objectivity, accuracy, and completeness of this report by ... holding public hearings in states affected by CCW disposal in order to get a comprehensive understanding of how individuals and communities are being affected by CCW. (POW00369)



I think the EPA should hold public hearings in states affected by CCW disposal. (CITZL0013)

AEP takes exception to the stated claims of some entities that they have not been given a chance to assist in the regulatory process and that they do not have time to digest and comment on the Phase II Report. Industry has long been engaged in the process leading to the Phase II Report, and other entities have had the same opportunity. (AEP00060)

## **XII. TRANSPARENCY OF REPORT AND RECORD**

Several commenters found the Report or specific aspects of the analysis, such as the risk assessment, opaque or difficult to understand. A public interest group commenter suggested that efforts to understand the Report would place an unreasonable burden on ordinary citizens and urged EPA to rewrite the report following the principles of President Clinton's "plain language" memorandum.

Response: EPA made every effort, given the highly technical nature of the information presented, to make the Report and supporting documentation as accessible as possible to the widest possible audience. Given the court-ordered deadline for this rulemaking, it was not possible to transform draft documents into polished final documents. However, the draft documents provided in the docket provided the public an adequate opportunity to comment on the key information that was before the Agency. EPA attempted to redress this by responding directly to the questions asked during the comment period, by offering repeatedly to meet with stakeholders (including public interest groups), and by supplementing the docket with additional information during and following the initial comment period, which was subsequently reopened by the Agency.

With regard to the comments specifically on the transparency of the risk assessment, EPA attempted to assist commenters in their understanding of the risk assessment by answering questions and providing additional information directly to commenters during the comment period, as discussed in more detail under Topic XI. EPA's responses to specific commenter questions about the risk assessment are included in the docket.<sup>18</sup> Furthermore, while EPA acknowledges that aspects of the highly technical risk assessment documentation may have been difficult to understand or follow, the Agency notes that any such difficulty does not appear to have prevented commenters from providing informed, insightful, and detailed comments on the risk assessment. These comments include analysis of the risk assessment methodology, underlying science, input values, calculations, and ultimate characterization of results. These comments reflect a thorough understanding of the risk assessment. Indeed, as discussed under Topics XIV through XVIII, EPA has revised aspects of its non-groundwater risk assessment and is conducting an intensive review of its groundwater model as a result of these comments.

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<sup>18</sup> FF2P-S0403. Memo: To Andrew Wittner, Re: Response to Margaret Round Questions of 5/12/99; FF2P-S0408. Memo: To Andrew Wittner, Re: Response to Margaret Round Questions of 8/30/99.

## **XII. TRANSPARENCY OF REPORT AND RECORD**

### **Verbatim Commenter Statements**

It should be noted at the outset that in our initial comments to EPA we provided a detailed discussion regarding the lack of transparency in the ground water risks to human health presented in the Report to Congress. Since then the review of materials available in the docket have not provided any additional information to assist us in replicating the risk assessment results. This inconsistency with the guiding principles of EPA's risk assessment and characterization policy (USEPA, 1995) is striking and substantially limits public participation in the regulatory process. (ALA00292)

The Report is far too vague, makes too many unsubstantiated assertions and leaves out large areas of needed discussion. To begin with, the Report does not contain the information necessary to address the "eight study factors" required to be addressed by Section 8002(n) of RCRA. We explained that the Report is vague and unintelligible. Much discussion centers on a "risk mitigation alternative" that would protect the public by requiring disposal of most utility fossil fuel wastes in lined sites with leachate collection and ground water monitoring. Ordinary people and the members of Congress can't read EPA's report. It is written in technojargon, and poorly written at that. (HEC00056)

Unfortunately, EPA's non-groundwater risk assessment methodology is too opaque for USWAG to fully comprehend or simulate in order to offer specific, more realistic numbers. Indeed, Dr. Chaney commented at the May 21st public hearing that he found the risk assessment impenetrable. (USWAG00037)

EPA's Risk Assessment Policies and Guidelines, including the 1995 EPA Risk Characterization Program, and the 1995 Guidance for Risk Characterization. These policies require EPA offices to conduct risk assessments reflecting transparency, clarity, consistency, and reasonableness. The Report falls short on each of these requirements. (49CAO00058)

One comment is applicable to the entire Risk Assessment and Report to Congress, the failure of EPA to make this a "transparent" document. If one must consult many other "hard to obtain" EPA documents, and search deeply into secondary documents to find the actual calculation methods used by EPA in the risk assessment, citizens are done a disservice. Understanding risk assessment is difficult under any circumstances. But finding out what the actual risk assessment was, especially for most limiting pathways for High End exposed susceptible populations, should not be as difficult as it has been with these documents. (PHS011)

We urge EPA to rewrite the report following the principles laid out in President Clinton's "plain language" memorandum of June 1, 1998. This memorandum instructed all agencies by January 1, 1999 to write all new documents in plain language. He said, "The Federal Government's writing

must be in plain language....Plain language saves the Government and the private sector time, effort, and money.” (HEC00056)

### **XIII. WASTE CHARACTERIZATION**

A variety of commenters expressed concerns about EPA's characterization of FFC wastes. Some public interest group, citizen, and academic commenters considered the characterization inadequate because of concerns about reliance on industry data, the statistical representativeness of the data, the adequacy of the analytical test methods and quality assurance procedures used, lack of consideration of certain constituents, and/or potential future changes in waste characteristics due to pending Clean Air Act regulations. One industry commenter expressed specific concern about EPA's characterization of FBC wastes. Other industry commenters defended EPA's use of industry data and selection of analytical test methods. Other industry and federal agency commenters provided information and research on waste characteristics and leaching. Specific issues are summarized below.

Response: EPA used all of the data available to it in its characterization of FFC wastes. The Agency is obligated to make use of the best available data and has done so in this case with full and explicitly noted consideration of its potential limitations. EPA believes its characterization to be complete and accurate. With regard to the constituents considered, EPA believes it has described all the constituents that were tested for and likely to be present in FFC waste as completely as possible based on the available data. The single commenter that expressed concern about the Agency's characterization of FBC waste did not identify specifically how this characterization might be inaccurate. These and other specific concerns raised by the commenters with regard to waste characterization are addressed in more detail in the sub-topic responses below.

### **XIII. WASTE CHARACTERIZATION**

#### **Verbatim Commenter Statements**

EPA candidly admits the data voluntarily provided are too limited for coming to any definitive conclusions regarding their representativeness on a national basis. (EDF00021)

EPA relied exclusively upon the electric power industry to fill this data gap, and EPA admits the data provided are much too limited to answer the fundamental questions. (EDF00021)

First, EPA consistently relies upon TCLP data as the waste contaminant concentration input to the groundwater model for landfills and some surface impoundments (where pore water sample data were unavailable), regardless of whether the leaching procedure accurately measures the leaching potential of the wastes under consideration. (EDF00021)

The Report is exclusively based on industry-provided data without information on the data collection, quality assurance, and quality control of analyses. This raises the issue of bias inherent in data provided by the industry potentially regulated by this proposal. (ALA00036)

Inadequate sampling of FFC wastes severely limits the characterization of FFC waste. (ALA00036)

However, EPA has not adequately characterized the waste, particularly wastes from cobuming coal with other potentially hazardous materials. (ALA00036)

EPA did not adequately characterize FFC wastes, including mercury releases ... the sampling size and statistical analysis of the data used in characterizing FFC waste is inadequate. (ALA00036)

In the groundwater risk assessment, concentrations may not be reflective of actual conditions due to the tests used. Specifically, the tests used to estimate the extent to which the metals leach from the waste may be inadequate. (ALA00036)

The important point is that the Agency should have low confidence in the waste characterization because the small data set and the leachate test results may not be representative of real-world facilities. (ALA00036)

It is unfortunate that the EPA chose to use TCLP as the test for evaluating wastes from FFC. (EERC00044)

We demand that EPA independently verify the validity of data, particularly data and information submitted by those who stand to gain direct financial benefits from the outcome of this Determination. (HEC00056)

EPA must gather its own data and verify the validity of information received from private sources to make definitive judgements and meet the burden of proof under RCRA for this determination. (HEC00056)

The Report and its risk assessments do not address the changing characteristics of fossil fuel wastes that may result from attempts to comply with new air pollution control standards. (HEC00056)

Specifically, we find that the conclusions being drawn to support continued exemption are inadequate and flawed in the following respects ... the Report is exclusively based on industry-provided data ... the wastes are not adequately characterized. (49CAO00058)

EPA should gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00256)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (VWI00258)

It will be critical to the success of any regulations promulgated by EPA that the agency either gather its own information or, at a minimum, establish a program to routinely split samples and check analyses submitted by applicants. (NPCA00259)

The EPA must gather its own information on CCW contamination rather than relying only on industry's biased reports. (CITZ00260)

I am very concerned by the fact that the EPA relied heavily on the cola industry as a primary source of information in compiling this report, and not enough on other sources. (CITZ00261)

I think relying on the strip mining industry to police itself is not a good course of action. Their data on coal combustion wastes is sure to be self-serving. (CITZ00262)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00263)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00264)

Rather than rely on industry biased information, EPA should gather its own information in regard to CCW contamination. (CITZ00265)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (SAVV00266)

The EPA should be attempting to use its own resources to build a body of empirical evidence regarding coal combustion. (CITZ00267)

CCW needs to much more strictly regulated, and EPA should do its own studies. (CITZ00268)

Unfortunately, EPA has relied heavily upon the very industry it is regulating as the major source of information in the report. (SIERRA00278)

EPA should make a strong effort to gather its own information on CCW contamination, rather than relying on industry. (SOCM00279)

Neither EP nor TCLP tests provide a good indication of leachability of CCW in natural disposal settings. (NCCLP00282)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00284)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (KYC00285)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00286)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00287)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00289)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00290)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00291)

The Report's use of questionable waste characterization data (which are at the heart of any analysis of whether or not to regulate as a hazardous waste) suggests that EPA's quantification of human health risks associated with exposure to groundwater contaminated with FFC waste is uncertain and likely underestimated. (ALA00292)

Due to the potential long term impacts of CCW burial on groundwater quality and the high cost in terms of funds, man-power, and environmental concerns should CCW's be proven to negatively



affect aquifers in which they're buried, I encourage EPA to research or obtain needed unbiased data from independent sources. Until conclusive results are obtained, I would also hope that the EPA would attempt to minimize potential harm to the public by discouraging dumping of CCW's in groundwater, encouraging the use of liners and monitoring systems, and adopting the treatment of CCW's as regulated materials under RCRA Subtitle C requirements for hazardous until wastes until long-term, unbiased data is collected. (PURD00294)

The EPA must develop its own technical background information and not rely only on information supplied by industry. (TRI00295)

I would urge you to collect your own data to confirm this. It would certainly be unwise to rely on the regulated industry for information. (CITZ00303)

We urge you to go into the communities and talk with watershed groups and citizen groups about these issues--to rely so heavily on industry's assessments is unbalanced, unscientific, and unwise. Many of the elements they feel will be 'locked up' in the high pH of ashes for instance, in reality leach out easily at high pHs, as well as at the more acidic. (PEACE00306)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00311)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00312)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00313)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00314)

First, I urge you to gather information on Coal Combustion Wastes from independent sources, not sources paid by the coal industry. (CITZ00315)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00316)

I have been informed that a significant amount of the early studies were based on data supplied by the studies of the industries who would benefit the most from improper disposal of CCW's. Your decision should be, obviously, based on your own data. The information from industry and environmental groups should be taken with a grain of salt - each will present data that support their respective views. (CITZ00317)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00318)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00319)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00320)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00321)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00322)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00323)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00324)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00325)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00326)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00327)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00331)

Currently, there is a growing nationwide movement to place mercury emission controls on coal-fired plants. If these controls are enacted, mercury concentrations will rise in CCW as more mercury is retained in the ash. Without responsible CCW disposal standards, emissions standards will not prevent mercury contamination from degrading the environment. We will only be changing the pathway by which it enters our streams and lakes. The impacts of mercury from CCW and higher concentrations of mercury in CCW created by mercury emission controls needs to be further studied by EPA. (HEC00332)

It is also imperative that the EPA not depend upon industry data regarding CCW contamination. There is a likelihood that these numbers are biased in the favor of the interests of polluters. It is a matter of common sense for the agency to collect its own information as to the risks associated with these toxic materials. (BUCK00333)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (NCSEA00334)

There are many cases where CCW had caused contamination of drinking water & ecological damage. Please conduct a diligent literature search so past mistakes can be avoided. It is important for the EPA not rely solely on the information provided by industry, as it is difficult for anyone to provide information detrimental to their own benefit. (CITZ00335)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00336)

First, I urge you to gather information on Coal Combustion Wastes from independent sources, not sources paid by the coal industry. The industry is famous for it's bias, slanted and carefully crafted designed "research" that would pass through NO peer reviews of neutral technical or scientific experts. Many people, homeowners, farmers, and much land have already been greatly harmed because the government agencies have relied on this kind of industry "research". (CITZ00337)

I wish to emphasize my belief that the EPA do an independent study instead of relying on data supplied by corporate interests. Simply put, when push comes-to-shove, I do not trust those folks to put the long-term interest of the public above the short-term interests of the bottom line. (CITZ00339)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00340)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00343)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00344)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00345)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00346)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00348)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00349)

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EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00351)

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EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00356)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00357)

Your agency has been studying the disposal problem for many years and decision time is at hand. The industry has used every method they could muster to minimize the hazardous and toxic nature of these wastes and get the agency to treat them as benign substances. More competent studies are now available to you and we hope you will give them the attention they deserve. (DCCC00359)

EPA should ensure the objectivity, accuracy, and completeness of this report by: gathering its own information rather than relying on highly biased information supplied by the industry and state agencies which behave more as advocates than observers. (POW00369)

I hope the EPA will strive to gather its own information on CCW contamination, rather than relying on coal company information. (CITZL0013)

Considering the lack of testing or monitoring for phenols at other ash sites around the country , further consideration and study of the presence of phenols in CCW is needed. (HECL0014)

Strip mining is not an environmentally acceptable practice to begin with, but to allow this industry to give you data on this important item is unconsonable. (CITZL0015).

To understand the environmental properties of a material, it is necessary to understand its chemical and physical nature. EPA's discussion of FBC fly ash and bed ash existing as oxides of major constituents (Al, Si., Fe, Ca, etc.) contains incorrect or inaccurate statements. Reference to oxides of major constituents is only a result of convention by analytical laboratories for mineral analyses. The ashes from FBCs are a mixture of reacted bed material, calcined bed material, unreacted bed material and calcined mineral impurities in fossil fuels (these impurities ate primarily clays). These fundarnental characteristics of PBC ashes were provided to the Agency (CIBO 1997-Chapter 5). I n that report, citations were provided to further elucidate the material properties of these CCPs. Statements by the Agency in the RTC concerning utility coal combustion ashes indicate a similar incorrect understanding of those materials. To understand the nature of these materials is fundamental to many other evaluations contained in the RTC. A correct understanding is necessary to properly interpret applicable chemical and physical data. Further, it is essential to accurately determine related factors in human and environmental risk analysis. (ISG00048).

Certain cornmenters have attacked the TCLP test as a flawed methodology ... That TCLP may not perfectly model leaching behavior in every waste and in every application is neither surprising nor relevant to this determination. (PG&E00274)

EPA properly relied on voluntarily submitted industry data in lieu of issuance of compulsory information demands. (USWAG00275)

These data are the most comprehensive data base ever assembled on the characteristics of FFC wastes and how they are managed as well as the geologic and climatic characteristics of FFC waste management units. (USWAG00275)

### **XIII. WASTE CHARACTERIZATION**

#### **A. Information Provided**

Industry trade group and federal government commenters provided information and research on waste characteristics and leaching.

Response: EPA thanks the commenters for the extensive information provided. EPA has considered this information as appropriate in the subtopic responses below.

### **XIII. WASTE CHARACTERIZATION**

#### **A. Information Provided**

##### **Verbatim Commenter Statements**

On the issue of the comanaged FFC wastes, research carried out at the Energy & Environmental Research Center (EERC) at the University of North Dakota has indicated that there exists the possibility of beneficial and synergistic chemical reactions that can be enhanced by well thought out combining of select process streams. In a research project on codisposal of coal gasification ash (Stevenson and others, 1988) it was shown that reductions of leachability of potentially problematic trace elements such as selenium and boron could be as high as a factor of over 300. This effect was calculated independently of any effects of dilution and was found to be a result of the formation of the mineral ettringite. The understanding of reactions and mineralogical transformations that resulted from this and other projects are directly relatable to other FFC wastes. The effects of ettringite formation and implications for regulation are discussed further below. (EERC00044)

The availability of alkaline constituents to provide the required high pH conditions are often the limiting factor with CCBs. Extensive research into ettringite formation has been carried out at the EERC in conjunction with North Dakota State University. In this study, numerous substituted ettringites were synthesized in the laboratory. The substituents were elements that tend to exist as oxonians in aqueous solution and enter into the ettringite structure by substituting for sulfate. Ettringites substituted with arsenic, boron, chromium, molybdenum, vanadium, and selenium have been prepared in the laboratory. Thus ettringite formation has the potential to influence the solution concentrations of these and probably numerous other elements, including aluminum, calcium, and sulfate, major constituents of the ettringite structure. It is also important to note that the rate of formation of ettringite in CCBs is dependent on the availability of the key ingredients in the structure. Since many of these are leached from the ash from various crystalline and amorphous phases, the formation of ettringite can take from hours to months, depending on the characteristics of the individual ash. Each ash, because of the variability of the phases making up these materials, is unique in this manner (Hassett and others, 1991). (EERC00044)

The leachate data can be interpreted in terms of the equilibrium solubilities of calcium arsenate phases. Nishimura and Robins (1997) and more recently Bothe and Brown (1999) have identified a series of new hydrated arsenates of calcium that are stable in the pH regime represented by FBC fly ashes. Nishimura and Robins (1997) show data for the solubility of a series of four calcium arsenates as a function of pH that spans the entire range for 0-14. These demonstrate an extreme pH dependence on the solubility of arsenic. At acidic pH's, arsenic exhibits a solubility approximating 75g/l. Between pH 3 and 10 the solubility steadily decreases, and between 10 and 12 it drops abruptly by a factor of 10,000 to a minimum of  $7.5 \times 10^{-6}$  g/L. At a pH of approximately 11, the solubility of arsenic reaches drinking water standards or 0.05mg/L. From

these two publications, it can be inferred that for the bituminous derived FBC fly ash, the average arsenic concentration is controlled by the solubility of  $\text{Ca}_3(\text{AsO}_4)_2 \cdot 3.66\text{H}_2\text{O}$ . Bothe and Brown (1999) have described a hitherto unidentified compound  $\text{Ca}_3(\text{AsO}_4)_2 \cdot 3.66\text{H}_2\text{O}$  in the same pH range which may likely be the stable phase controlling the arsenic concentration in solution. The FBC ash derived from anthracite culm is under saturated with respect to the reported equilibrium arsenic phases by a factor of 100 times at the recorded pH. This may in part be reflected by the lower initial concentration of arsenic in the ash or perhaps associated with the metamorphic origin of the arsenic in the original coals. (ARIPPA00019)

PG&E Gen regularly tests the chemical properties of the FBC ash byproduct produced by PG&E Gen's FBC facilities using standard EPA test methods. PG&E Gen's data were provided to EPA by CIBO in November 1997 for use in the Report. These data support EPA's findings in the Report that the FBC ash is not a hazardous waste as defined by RCRA. (PG&E Gen's data were also prepared for the more comprehensive data analysis appended to the ARIPPA comments and is not repeated here.) Ash generated at PG&E Gen's FBC facilities does not exhibit any of the four hazardous waste characteristics that identify hazardous wastes. With respect to toxicity, ash from PG&E Gen's facilities consistently test below the TCLP test leaching standards for RCRA constituents, including arsenic and mercury. (PG&E00023)

It has come to my attention that some misinterpretations may have arisen from the article forwarded to you by Dr. H. M. "Skip" Kingston titled "Treating Hexavalent Chromium In Fly Ash Leachate Using Acid Mine Drainage." As prima? author of that paper, I would like to clarify any possible misinterpretations before they advance too far. It was never my intent to suggest that Cr(VI) is a serious problem at electric generating ash disposal sites generally. The data proposed in the paper supports no such notion. In fact, exhaustive research by the Electric Power Research Institute demonstrates the opposite -- that Cr(VI) in fly ash is not widespread. The point of the paper is that when Cr(VI) is found to be present in a landfill leachate (be it a fly ash landfill or otherwise), it may represent a problem to be addressed through remediation. Specifically, my sole intent in writing the paper, and the supporting data contained within the paper, are designed to illustrate that reduction of Cr(VI) by use of acid mine drainage is a viable remediation option worth consideration at any site where Cr(VI) is a problem. (AES00250)

Attached as Appendix III is a coal and ash leachate analysis prepared by Panther Creek Partners in Carbon County comparing ash to local native garden soil and to local clay. The arsenic concentration of the ash was 18 ppm, compared to 17 ppm for the native garden soil and 10 ppm for the clay. The ash leachate analysis yielded 0.008 mg/L arsenic, compared to 0.031 mg/L for the garden soil and 0.01 for the clay. These results are similar to the results of comparative laboratory tests from other waste coal plants. See, e.g., Appendices II and III to ARIPPA's 6/12/99 Comments, showing 24 ppm arsenic content in ash from the Northampton Generating Plant in Northampton County. (ARIPPA00273)



The cementitious nature of the ash from a waste coal plant is such that, if a truck back-hauling ash to a mine site has a flat tire and is delayed by more than a couple of hours, the ash has to be jack-hammered out of the truck. In short, CFB ash has physical characteristics that begin to approach the properties of Portland cement concrete, including a hydraulic conductivity of 10(-5) to 10(-7) cm/sec. (ARIPPA00273)

CIBO further commends to the Agency's attention significant research and analysis of fluidized bed ash characteristics conducted by Mr. Sarma Pisupati of (Pennsylvania State University). (CIBO00280)

There are a number of scientists concerned about flushing CCW into underground exhausted coal mine shafts due to trace metal toxicity from fly ash particles accompanied with high levels of conductivity, total dissolved solids [TDS, and sodium (Na). The last three parameters, by the way, do not have national water quality criteria (WQC) restrictions to protect aquatic life. I have found that effluents with conductivity approaching 4,000 mmhos/cm, 3,500 mg/L TDS and 1,100 m/lg Na/L to be acutely toxic to *Ceriodaphnia dubia* in my recent research efforts of the latter 1990's. A number of underground deposition areas of CCW exceed these limits according to data being generated by the HEC. They are condensing their data and will make it available to you shortly. (VAT00309)

I published a study in 1987 (Cherry, Van Hassel, Ribbe and Cairns - Factors Influencing Acute Toxicity of Coal Ash to Rainbow Trout and Bluegill Sunfish) in the Water Resources Bulletin (23:293-306) that documented trace metal distribution on fly ash particle surfaces and the resulting acute toxicity to fish. Surface and subsurface enrichment of fly ash was found for cadmium, copper, chromium, nickel, lead, mercury, titanium, arsenic and selenium using ion microscopy. Metal enrichment develops when the fly ash particles are caught in the electrostatic precipitators where trace metal fumes condense on the trapped cooler ash particles. Bottom ash, which is collected from the furnaces and bypasses the electrostatic precipitator process, is void of trace metal enrichment and is not toxic. This latter fact was also documented in my 1987 publication. I can expand upon the results of this study in the future but time constraints prevent that from occurring here. (VAT00309)

DOE's research in this area (which is summarized in matrix form in Appendix 1), includes:

- In-house leaching tests on 28 fly ash samples. These studies showed that the release of trace elements was variable but relatively small. Summaries of field tests in Colorado and Illinois that showed that release of trace elements to the environment was negligible when FBC wastes were placed in simulated landfill disposal cells. (DOE00020)

For example poly-aromatic hydrocarbons (PAHs) are a highly carcinogenic family of chemicals commonly found in coal, coal tar and coal combustion products, yet these substances are seldom if ever analyzed for in ash characterization schemes mandated by state regulatory agencies and never

included in ground water monitoring schemes for CCW disposal sites. Wise et al demonstrated the presence of numerous PAHs in a coal tar standard reference material [Determination of Polycyclic Aromatic Hydrocarbons in a coal tar standard reference material, Stephen A. Wise, Bruce A. Benner, Gary D. Byrd, Stephen N. Chesler, Richard E. Rebbert, and Michele M. Schantz, 1988, *Anal. Chem.* 60:887-894]. They also noted the presence of sulfur, nitrogen and oxygen containing poly-cyclic aromatic heterocyclic compounds. In an analysis of PAHs in coal-derived sources, Nishioka et al readily identified PAHs with up to six rings. In samples a coal tar, a heavy distillate of coal, and a carbon black sample, they detected 25, 34, and 25 different PAHs, respectively [Structural characteristics of polycyclic aromatic hydrocarbon isomers in coal tars and combustion products, Masaharu Nishioka, Huey-Ching Chang, & Milton L. Lee, 1986, *Environ. Sci. Technol.* 20:1023-1027]. In addition, many compounds with sulfur substitutions were identified. (HEC00332)

The PAH content of coal combustion waste depends upon a variety of factors including the type of coal, the rate of burning, and whether the plant is mechanically or manually fired. PAHs are products of incomplete combustion. Hanson et al have detected many PAHs and related compounds in extracts of filter bag ash [Detection of nitroaromatic compounds on coal combustion particles, R.L. Hanson, T.R. Henderson, C.H. Hobbs, C. R. Clark, R.L. Carpenter, J.S. Dutcher, T.M. Harvery, & D.F. Hunt. 1983, *J. Toxicol. Environ. Health* 11:971-980]. Srivastava et al used a benzene extract of coal fly ash to study the effects of PAHs on rats [Fetal translocation and metabolism of PAH obtained from coal fly ash given intra-tracheally to pregnant rats, V.K. Srivastava, S.S. Chauhan, P.K. Srivastava, V. Kumar, & U.K. Misra, 1986, *J. Tox. Environ. Health* 18:459-469]. Harrison et al found that the total quantities of PAHs were greater for ash from an electrostatic precipitator than for ash from a wet scrubber [Comparison of organic combustion products in fly ash collected by a venturi wet scrubber and an electrostatic precipitator at a coal fired power station, Florence L. Harrison, Dorothy J. Bishop & Barbara J. Mallon, 1985, *Environ. Sci. Technol.* 19:186-193]. Their results revealed PAHs with two three or four ring structures and no PAHs with five or more rings, though they acknowledge that their recovery rates were low, especially for PAHs with more than four rings. (HEC00332)

Griest and Guerin found that many organic compounds are still volatile at ESP temperatures and pass up the stack [Identification and Quantification of Polynuclear Organic Matter (POM) on Particulates from a coal fired power plant, W.H. Griest and M.R. Guerin, 1979 interim report, Oak Ridge National Laboratory]. Griest and Guerin also found more PAHs in stack ash than in ash from an electrostatic precipitator. As more impurities are removed from the stack to comply with evolving air regulations, more products of incomplete combustion are likely to end up in coal combustion waste. (HEC00332)

While the Harrison study [ibid] concludes that the concentrations of PAHs detected in fly ash probably would not pose an environmental hazard, they acknowledge that their recovery of these compounds was low when they injected known concentrations of standards into their column. It is

often difficult to identify PAH isomers because of their similar retention times and fragmentation patterns when using high resolution chromatography and mass spectrometry. Nishioka et al [ibid] found that it was possible to identify isomeric PAHs with two to six rings using a specialized column substrate in the gas chromatograph. Wise et al [ibid] certified concentrations of 12 PAHs in coal tar based on agreement between gas chromatography and liquid chromatographic techniques. They provided informational values for 18 additional compounds. Many PAHs are toxic, carcinogenic and/or mutagenic. Their bioaccumulation is limited due to metabolism. However, the metabolism itself may produce oxidation damage in tissues. Further, the metabolic breakdown products can be more mutagenic than their precursors [Hanson et al]. PAHs can undergo chemical reactions with nitrogen, oxygen and sulfur compounds to form substituted aromatic compounds. Hanson et al reported that treating fly ash samples with N<sub>2</sub>O, at 1 or 10 ppm greatly increased the mutagenicity of the samples (up to 3200-fold). They attribute this to the formation of dinitropyrenes and dinitrofluoranthenes. It should be noted that these nitro PAHs were found in untreated flyash, presumably due to reaction with nitrous oxides in combustion gases. (HEC00332)

PAHs adhere strongly to ash, making analysis of quantities and types of PAHs difficult. Griest and Guerin [ibid] found that only 18% of PAHs were recovered from fly ash. Harrison et al report that large losses occurred when known concentrations of PAHs were injected into the gas chromatograph-mass spectrometer. It was not known whether these degraded or adhered to the column. However, it was concluded that the absence of detection of high molecular weight PAHs in the GC-MS analyses did not imply that these were not present in the ash. Larger PAHs with more than four rings are generally thought to be insoluble. However, little is known about the chemical reactions and or microbial transformations that may occur under storage conditions. These transformations could result in increased mobility and or increased mutagenicity of the constituents [Harrison et al]. Indeed, Hanson et al [ibid] indicate that some nitro PAHs may be mutagenic at concentrations too low to be detected by direct gas chromatography-mass spectrometry. (HEC00332)

The situation with radionuclides is similar to that for PAHs in that they are known to be present in coal combustion wastes, yet ground water monitoring for radionuclides at CCW disposal sites rarely occurs. According to the National Council on Radiation Protection and Measurements (NCRP) the average radioactivity in a short ton of coal is 0.00427 millicuries/ton, primarily in the form of uranium and thorium. During combustion the volume of the coal is reduced by over 85%, but the uranium and thorium content is reduced very little. Therefore the ash is enriched in radionuclides. Since the half-lives of these radionuclides are practically infinite in terms of human lifetimes, the accumulation of these substances in the biosphere over time is a significant health concern that has not been addressed. [Coal Combustion: Nuclear Resource or Danger, Alex Gabbard, 1993, Oak Ridge National Laboratory REVIEW No. 3 and 4.] Gabbard [ibid] points out that the low levels radiation emitted by coal ash would provoke an enormous public outcry if similar amounts were released by a nuclear powered electric utility. He even suggests that coal combustion waste could be refined to produce fuel for nuclear powered facilities. (HEC00332)

In a study of the effects on coal fly ash settling ponds at the Baily Power Station on water quality in and around the Indiana Dunes National Lakeshore in northwestern Indiana, the U.S. Geological Survey found an increase in gross alpha and beta radioactivity in the settling ponds and in an interdunal pond fed by seepage. EPA recommends further analysis if gross alpha and beta radioactivity exceeds 15 pCi/L and 5 pCi, respectively. Results suggest that these levels were not exceeded at this particular site. [Effects of coal fly-ash disposal on water quality in and around the Indiana Dunes National Lakeshore, Indiana, 1981, Mark A. Hardy, U.S. Geological Survey Water Resources Investigation 81-161]. However, the cumulative effects of continuing to dispose of coal combustion waste in this manner is a concern. Despite the paucity of monitoring at CCW disposal sites for radionuclides, HEC has uncovered a number of reports indicating the concentration of radioactivity 'in coals and coal combustion wastes. (See attachment 23) (HEC00332)

### **XIII. WASTE CHARACTERIZATION**

#### **B. Reliance on Industry Data**

Public interest group and citizen commenters stated that the Report was exclusively based on industry-provided data. The commenters were concerned over the potential bias inherent in data provided by the industry potentially regulated by this proposal. An industry commenter, on the other hand, argued that EPA properly relied on voluntarily submitted industry data in lieu of issuance of compulsory information demands.

Response: EPA considered all available information in this determination. The Agency also conducted some independent sampling to compare to industry supplied data. We found that our sampling results were consistent with data supplied by industry.

In addition, EPA conducted sensitivity analyses to assess a potentially broader range of constituent concentration levels. For key variables, we selected a range of values to bound our analysis and understand the impact of values outside those provided voluntarily by industry.

**XIII. WASTE CHARACTERIZATION**  
**B. Reliance on Industry Data**  
**Verbatim Commenter Statements**

EPA relied exclusively upon the electric power industry to fill this data gap, and EPA admits the data provided are much too limited to answer the fundamental questions. (EDF00021)

The Report is exclusively based on industry-provided data without information on the data collection, quality assurance, and quality control of analyses. This raises the issue of bias inherent in data provided by the industry potentially regulated by this proposal. (ALA00036)

We demand that EPA independently verify the validity of data, particularly data and information submitted by those who stand to gain direct financial benefits from the outcome of this Determination. (HEC00056)

EPA must gather its own data and verify the validity of information received from private sources to make definitive judgements and meet the burden of proof under RCRA for this determination. (HEC00056)

The report is exclusively based on industry-provided data. This Report is based almost entirely on data provided by industry strongly suggesting the possibility of conflict of interest. One of the Report's peer reviewers pointed out this problem, noting the potential for bias, however it is not apparent anywhere that EPA took action based on the reviewer's comment. (49CAO00058)

EPA should gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00256)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (VWI00258)

It will be critical to the success of any regulations promulgated by EPA that the agency either gather its own information or, at a minimum, establish a program to routinely split samples and check analyses submitted by applicants. (NPCA00259)

The EPA must gather its own information on CCW contamination rather than relying only on industry's biased reports, report all cases where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage, hold public hearings in states affected by CCW disposal and regulate CCW disposed in mines under the federal Resource Conservation and Recovery Act (RCRA) Subtitle C, as a hazardous waste. (CITZ00260)

I am very concerned by the fact that the EPA relied heavily on the cola industry as a primary source of information in compiling this report, and not enough on other sources. Rather than relying on the blatantly-biased "data" provided by the industry, the EPA needs to uphold its duty as a federal agency to exercise oversight in matters such as these, and to collect its own data. There are a number of factors to consider. (CITZ00261)

I think relying on the strip mining industry to police itself is not a good course of action. Their data on coal combustion wastes is sure to be self-serving. (CITZ00262)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00263)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00264)

Rather than rely on industry biased information, EPA should gather its own information in regard to CCW contamination. (CITZ00265)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (SAVV00266)

The EPA should be attempting to use its own resources to build a body of empirical evidence regarding coal combustion. (CITZ00267)

CCW needs to much more strictly regulated, and EPA should do its own studies. (CITZ00268)

Unfortunately, EPA has relied heavily upon the very industry it is regulating as the major source of information in the report. (SIERRA00278)

EPA should make a strong effort to gather its own information on CCW contamination, rather than relying on industry. (SOCM00279)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00284)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (KYC00285)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00286)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00287)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00289)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00290)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00291)

EPA extensively relied on data from the regulated community in developing the Report to Congress, which practice the Agency knew potentially could bias the outcomes of the various studies forming the basis for its Regulatory Determination. (ALA00292)

Due to the potential long term impacts of CCW burial on groundwater quality and the high cost in terms of funds, man-power, and environmental concerns should CCW's be proven to negatively affect aquifers in which they're buried, I encourage EPA to research or obtain needed unbiased data from independent sources. Until conclusive results are obtained, I would also hope that the EPA would attempt to minimize potential harm to the public by discouraging dumping of CCW's in groundwater, encouraging the use of liners and monitoring systems, and adopting the treatment of CCW's as regulated materials under RCRA Subtitle C requirements for hazardous until wastes until long-term, unbiased data is collected. (PURD00294)

The EPA must develop its own technical background information and not rely only on information supplied by industry ... It is the responsibility of the EPA to make an unbiased evaluation of all of the technical information available. (TRI00295)

I would urge you to collect your own data to confirm this. It would certainly be unwise to rely on the regulated industry for information. (CITZ00303)

We urge you to go into the communities and talk with watershed groups and citizen groups about these issues--to rely so heavily on industry's assessments is unbalanced, unscientific, and unwise. (PEACE00306)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00311)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00312)



EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00313)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00314)

First, I urge you to gather information on Coal Combustion Wastes from independent sources, not sources paid by the coal industry. (CITZ00315)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00316)

I have been informed that a significant amount of the early studies were based on data supplied by the studies of the industries who would benefit the most from improper disposal of CCW's. Your decision should be, obviously, based on your own data. The information from industry and environmental groups should be taken with a grain of salt - each will present data that support their respective views. (CITZ00317)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00318)

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EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00331)

It is also imperative that the EPA not depend upon industry data regarding CCW contamination. There is a likelihood that these numbers are biased in the favor of the interests of polluters. It is a matter of common sense for the agency to collect its own information as to the risks associated with these toxic materials. (BUCK00333)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (NCSEA00334)

It is important for the EPA not rely solely on the information provided by industry, as it is difficult for anyone to provide information detrimental to their own benefit. (CITZ00335)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00336)

First, I urge you to gather information on Coal Combustion Wastes from independent sources, not sources paid by the coal industry. The industry is famous for it's bias, slanted and carefully crafted designed "research" that would pass through NO peer reviews of neutral technical or scientific experts. Many people, homeowners, farmers, and much land have already been greatly harmed because the government agencies have relied on this kind of industry "research". (CITZ00337)

I wish to emphasize my belief that the EPA do an independent study instead of relying on data supplied by corporate interests. Simply put, when push comes-to-shove, I do not trust those folks to put the long-term interest of the public above the short-term interests of the bottom line. (CITZ00339)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00340)

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Your agency has been studying the disposal problem for many years and decision time is at hand. The industry has used every method they could muster to minimize the hazardous and toxic nature of these wastes and get the agency to treat them as benign substances. More competent studies are now available to you and we hope you will give them the attention they deserve. (DCCC00359)

EPA should ensure the objectivity, accuracy, and completeness of this report by: gathering its own information rather than relying on highly biased information supplied by the industry and state agencies which behave more as advocates than observers. (POW00369)

I hope the EPA will strive to gather its own information on CCW contamination, rather than relying on coal company information. (CITZL0013)

I think relying on the strip mining industry to police itself is like letting the fox into the henhouse. (CITZL0015).

EPA properly relied on voluntarily submitted industry data in lieu of issuance of compulsory information demands. EDF sounds an alarm over EPA's reliance upon industry data and "failure" to invoke its authority under RCRA § 3007 to demand information from the industry. EDF's alarm is misplaced and fails to appreciate the statutory instruction for the Bevill study to proceed in a cooperative and efficient manner. Section 8002(n) of RCRA states that "the Administrator shall . . . invite participation by other concerned parties, including industry and other Federal and State agencies, with a view toward avoiding duplication of effort."<sup>64</sup> In response to EPA's invitation to participate, USWAG and EPRI provided EPA with a wealth of data that were collected and analyzed in close cooperation with the Agency over a period of 18 years. Industry's cooperation rendered it unnecessary for EPA to resort to its compulsory process authority. Whether or not such demands were necessary in other Bevill studies is irrelevant. EPA has been provided with the extensive data necessary to make a fully informed determination in full consultation with EPA staff who defined the scope of the Agency's information needs. And EPA conducted its own analysis of data samples and conducted site visits to locations of its own choosing to verify the reliability of the data it had received. From the outset of the study, USWAG and EPRI have worked to inform EPA's decisionmaking by providing all available information. We have done so because we are confident that an informed, science-based evaluation will confirm our long-held belief that no hazardous waste regulation of FFC waste management units is warranted. It is clearly in our best interest for that decision to be reached as soon as possible - without time consuming clashes over document requests - to remove uncertainty and unwarranted apprehension among our investors, State and local regulators, our employees, and the public that lives near our sites and are our customers. There was simply no reason for EPA to transform a cooperative study into a contentious, adversarial contest. The claim that EPA has neglected its duties by not serving information request letters when that information was already forthcoming is ludicrous. (USWAG00275)

### **XIII. WASTE CHARACTERIZATION**

#### **C. Representativeness of Data**

Several public interest group commenters argued that the sampling size and statistical analysis of the data used in characterizing FFC waste was inadequate. One of the commenters further compared the site averaged data to published values from literature to support its argument that the comanaged waste data were not adequately representative. The commenter further stated that, based on the literature, EPA should have used higher values in its risk assessment. An industry commenter, on the other hand, characterized the data as the most comprehensive data base ever assembled on the characteristics of FFC wastes.

Response: In terms of sampling size, for FBC wastes and oil combustion wastes, EPA believes the population of facilities sampled was adequate and representative. Sampling data were available for approximately 30 percent of the facilities in these sectors. EPA acknowledges concerns that data were available for a relatively small number of sites for comanaged coal combustion wastes. The Agency, however, is obligated to make use of the best available data. Furthermore, EPA notes that the comanaged waste sites sampled, although few in number, were from a wide range of geographic regions throughout the U.S. They were also representative in terms of the combinations of large-volume and low-volume wastes comanaged (see page 3-16 of the Report to Congress).

EPA believes its analysis of the available waste characterization data to be complete and accurate as well as adequate for the intended uses. First, the Agency used all of the available data in its statistical analyses of waste characterization data. Second, the Agency complied with its own Agency-wide guidance concerning the analysis of the data, including treatment of the data, calculation of relevant statistics, and appropriate use of quality assurance procedures. Third, no commenters or other parties identified specific instances of problems or issues with EPA's treatment of data. Fourth, no commenters or other parties identified or suggested specific instances where alternate methods of data treatment are more appropriate than those used by the Agency..

In general, the data from EPA's characterization efforts are roughly similar to the literature data cited by the public interest group commenter (similar means and ranges). This supports the representativeness of EPA's characterization data. The commenter compares the maximum values cited in the literature to the site averaged data presented in EPA's characterization. The Agency points out that the data presented in the literature are not site averaged. Therefore, the maximum values presented represent single sample results that may not be broadly representative of the majority of waste generated over time at a given facility. EPA believes that the use of these single-sample maxima in the risk assessment would result in an overestimate of risk. As discussed under Topic XIV.G, EPA believes that site averaging is, for purposes of this study, an appropriate way to generate representative, yet conservative (i.e., erring on the side of safety), input values for risk assessment.

EPA acknowledges that the input values (95<sup>th</sup> percentile site averages) used in the risk assessment are, as stated by the commenter, similar to the mean values presented in the literature for some constituents. The Agency notes, however, that not only are the data in the literature not site averaged, but the mean values reported in the literature represent the mean of detected concentrations. In its characterization, EPA treated samples reported as below the detection limit as ½ the reported detection limit. The failure to account for samples reported below the detection limit would result in mean values that are not representative of the full range of concentrations that may be present in the waste, particularly for constituents (such as arsenic) for which a large number of samples may be below detection. Therefore, because they are not site averaged and do not account for samples below detection limits, it is unsurprising the “mean” values in the literature are comparable to the high-end values used in the risk assessment.

**XIII. WASTE CHARACTERIZATION**  
**C. Representativeness of Data**  
**Verbatim Commenter Statements**

EPA candidly admits the data voluntarily provided are too limited for coming to any definitive conclusions regarding their representativeness on a national basis. For coal combustion wastes, the data provided covered only 1% of landfill and 3% of impoundments (17 facilities in total), and the number of landfills from which the TCLP data were derived “may contribute to uncertainty in these results.” (EDF00021)

The sample size and statistical analysis of the data used in characterize FFC waste is inadequate. One of the key parameters in the risk assessment is the concentration of the various constituents in the waste. The Agency admits that it is unsure whether the data characterizing the wastes are representative. How could they be representative when less than one percent-of the landfills were sampled and less the three percent of the impoundments? EPA has not provided any information to support whether the sampling conducted for the Report adequately characterizes FFC wastes. (ALA00036)

The wastes are not adequately characterized. The lack of supportive data on the extent to which FFC waste has been characterized in the Report undermines the Report's conclusions and findings with respect to potential impacts on public health and the environment. For example: Only 17 sites and limited samples were used to characterize 600 management sites. The Agency admits that it is unsure whether the data characterizing the wastes are representative. Sophisticated modeling is of no use without adequate input data. (49CAO00058)

The limited sampling data used to characterize FFC waste constituents and other serious problems with the site investigations indicates that the concentration range of FFC waste constituents has not been adequately characterized in the Report to Congress. As discussed below, there should be low confidence placed on the database used to characterize FFC waste. (ALA00292)

We reviewed the peer-reviewed literature to check whether other researchers have characterized the constituents of fossil fuel combustion wastes. Table 3 summarizes these findings. for the eight metals included in the EPA analysis as constituents of concern. for coal fly ash and bottom ash. Data were not located in the literature for co-managed wastes. We found that for the eight metals selected for review, the values used by EPA are all in the range of published values. However, the facility maximums reported by EPA are all lower than the maximums in the literature for fly ash. For nickel and lead, this difference is more than an order of magnitude. The facility-averaged 95<sup>th</sup> percentile values used by EPA are closer to the mean fly ash values in the literature. Perhaps most importantly, in the draft Report to Congress, the EPA recognizes that “the industry-provided contaminant data presented a problem” (see page I-8 of the Report to Congress). The Report goes on to say: “EPA tested these at up to three times reported levels. but did not test for the possibility

that even higher levels might exist. Uncertainty still exists as to the nationwide representativeness of this key input variable.” Although it is not stated what “reported level” was tested (i.e., was it the mean, maximum, median?), the data in Table 3 illustrate that, with the exception of cadmium, maximum values reported in the literature (using fly ash as an example) are significantly higher than 3 times the facility-averaged value used by EPA. This suggests that while the industry-provided values used by EPA may represent the high-end values for the facilities tested they may underestimate the concentrations found industry-wide. (ALA00292)

Less than 3 percent of the waste management units operating in the U.S. were sampled for the Report to Congress. EPA is relying on only 14 site investigations to characterize - both spatially and temporally - a complex mixture of FFC waste disposed of in waste management units (WMUs) that varied in size from as small as a few acres to more than 1,500 acres. In addition, these WMUs comanage waste ranging from 1 to 15 different low-volume waste streams along with 1, 2, or 3 different large volume wastes. EPA presents no scientific basis to support the notion that the 14 site investigations provide sufficient statistical power to distinguish variations between facilities - or even variations within facilities. It should also be noted that the inadequacy of the analytical monitoring data used to characterize the toxic constituents in FFC waste was consistently identified by EPA and the contractors that conducted both the groundwater risk assessment and the non-groundwater risk assessment. (ALA00292)

These data are the most comprehensive data base ever assembled on the characteristics of FFC wastes and how they are managed as well as the geologic and climatic characteristics of FFC waste management units. EPRI’s data collection efforts included in situ samples obtained from 18 sites with active or recently closed management units, as well as porewater samples from drill cores taken from impoundments and landfills used to co-manage fly ash, bottom ash, and/or flue gas desulfurization waste with low volume wastes. Additional data were provided principally through an EPRI study of co-management practices, which surveyed 253 active coal combustion waste management units. This study was developed in consultation with EPA staff to ensure the quality and representativeness of the data. See USWAG Initial Comments at 22-23. (USWAG00275)



### **XIII. WASTE CHARACTERIZATION**

#### **D. Adequacy of TCLP and EP Tests**

Industry, academic, and public interest group commenters questioned whether the TCLP test adequately represents the leachate from FFC wastes. Commenters variously expressed concern that the TCLP may underestimate or overestimate the leaching of the various waste constituents. Specific concerns raised were that: the TCLP underestimates the leaching potential of alkaline wastes; the TCLP underestimates leaching in acidic environments such as might be created by mill rejects; the TCLP does not adequately represent long-term leaching following ettringite formation; and the EP test was found to be inadequate by the SAB in 1991. Another commenter pointed to the SAB's recommendations about revising the TCLP. One of the commenters stated that TCLP or EP tests would not be appropriate unless FFC waste were disposed in a municipal landfill. Another commenter suggested that long term leaching tests using a solution approximating percolating ground water would be more appropriate and accurate.

One industry commenter supported the use of the TCLP as a reflection of probable leaching conditions in soil amendment applications of CCW, but stated that the TCLP may overstate leachate concentrations in minefill operations. This commenter concluded that it is neither surprising nor relevant to the determination that the TCLP may not perfectly model leaching behavior in every waste and in every application.

Response: The Agency acknowledges that the TCLP is designed to simulate the leaching conditions found at a typical municipal solid waste landfill and that conditions in FFC waste management units may be different from those in municipal solid waste landfills. EPA has no evidence, however, to indicate that these differences are significant enough to invalidate TCLP or EP test results as reasonably representative of FFC waste leachate. Furthermore, for many of the waste types studied, the only leaching test results available to EPA were TCLP and/or EP results. In the one case where EPA had porewater data for comanaged coal combustion wastes in surface impoundments, the Agency made use of these data in its characterization and risk assessment. For other wastes and management scenarios, EPA made use of the best available leachate characterization data, which were TCLP and/or EP data. The Agency notes that most of the commenters did not provide any suggestion as to leaching procedures that would be more accurately representative. Some commenters did recommend alternate leaching test procedures, including a synthetic ground water leach procedure and an ASTM leach extraction procedure.

EPA agrees that results of long-term leaching using a solution designed to simulate ground water would be a useful tool in waste characterization. However, insufficient amounts of such data were available for this study. Furthermore, the resources required to develop site-specific methods and collect and evaluate such data likely would be prohibitive.

**XIII. WASTE CHARACTERIZATION**  
**D. Adequacy of TCLP and EP Tests**  
**Verbatim Commenter Statements**

Perhaps in an effort to minimize the inappropriate use of TCLP data in this case, EPA does not provide the pH of the coal combustion or other fossil fuel combustion wastes that are described in the current Report to Congress, on either an as-generated or co-managed basis. However, in the general descriptions of low-volume coal combustion wastes provided, the Agency notes boiler chemical cleaning waste and water treatment wastes exhibit the corrosivity characteristic, and thus may have a pH greater than or equal to 12.5. See 1999 Report to Congress, Table 3-5. And in the earlier Report to Congress, EPA indicated dual alkali FGD sludge has a pH of 12.1, and boiler blowdown has a pH of up to 12.0. See 1988 Report to Congress, Exhibits 3-17, 3-20. (EDF00021)

First, EPA consistently relies upon TCLP data as the waste contaminant concentration input to the groundwater model for landfills and some surface impoundments (where pore water sample data were unavailable), regardless of whether the leaching procedure accurately measures the leaching potential of the wastes under consideration. For example, EPA is fully aware that the TCLP seriously understates the leaching potential of highly alkaline wastes. Although some coal combustion wastes under consideration (and perhaps others as well) are highly alkaline, EPA still uses TCLP data in the groundwater model. Moreover, at least one of the low volume wastes (coal mill rejects) can become reactive if sufficient concentrations of pyrites are present. (EDF00021)

Moreover, at least one of the low volume wastes (coal mill rejects) can become reactive if sufficient concentrations of pyrites are present. Over time, these wastes can present "acid causing conditions" at some disposal locations. Yet there is absolutely no discussion in the Report as to whether TCLP data can be used to represent reasonable worst-case waste leachability under such acidic disposal conditions. (EDF00021)

A good indication of the weakness of the TCLP for the wastes in question can be found in Table 3-9 of the Report to Congress. In this table, EPA provides TCLP data (covering wastes in both landfills and surface impoundments) and pore water sample data (covering surface impoundments) for co-managed coal combustion wastes. For every toxic contaminant but mercury, both the mean and upper range of the pore water data exceed the TCLP data, typically by an order of magnitude or more. In the case of arsenic wastes, a particularly important contaminant in coal combustion the difference between the mean pore water and TCLP data is almost two orders of magnitude. Insofar as the pore water data represent "actual leachate" results for surface impoundments, it is clear that the TCLP data consistently fail to predict the actual concentration of contaminants available for migration into groundwater. (EDF00021)

EPA cannot simply rely upon the TCLP because it is the test used in the current toxicity characteristic. The procedures employed in EPA's risk modeling must bear some rationale relationship to anticipated disposal conditions, particularly where the TCLP underpredicts waste

leachability and therefore is not a valid indicator of “potential” risks. See Columbia Falls, *supra*, at 922-3. (EDF00021)

While EPA claims TCLP data “are believed” to better represent leaching conditions in landfills, it never explains the reasons for this belief. Report to Congress at 3-18. In fact, the TCLP data in Table 3-9 are provided for both landfills and surface impoundments, and appear to be dominated by surface impoundments given the Agency's concern that “a much smaller number of landfills are reflected in the data.” Report to Congress. (EDF00021)

In the groundwater risk assessment, concentrations may not be reflective of actual conditions due to the tests used. Specifically, the tests used to estimate the extent to which the metals leach from the waste may be inadequate. EPA has not demonstrated that the leachate tests (Toxicity Characteristic Leaching Procedure, TCLP) for landfills and leachate represented by pore water samples for impoundments is adequate for risk assessment. In a February 26, 1999 memo from the Science Advisory Board's (SAB) Environmental Engineering Committee to the Administrator, the SAB reminds EPA that in 1991 the SAB recommended improvements to leaching test procedures. The Agency has not used the SAB's recommendations to revise the TCLP or to develop other protocols. Use of the TCLP may underestimate or overestimate the leaching of the various waste constituents. The SAB subcommittee noted that leach testing needs to account for more leaching parameters because these parameters have a direct affect on actual leaching of contaminants from waste in the field. The important point is that the Agency should have low confidence in the waste characterization because the small data set and the leachate test results may not be representative of real-world facilities. (ALA00036)

Since significant alteration of chemistry and mineralogy is exhibited by certain classes of FFC wastes, it is imperative that testing methods used to evaluate the potential for adverse environmental impact be flexible and up to date to incorporate state-of-the-art scientific understanding. Leaching characterization, for example, should incorporate long-term equilibration times to allow for potential mineralogical changes such as formation of ettringite to take place and should utilize a leaching solution that reflects what would happen at specific sites. The toxicity characteristic leaching procedure (TCLP) and extraction procedure (EP) toxicity test procedures using acetate buffer or dilute acetic acid with an 18-hour equilibration time would likely never be appropriate unless FFC wastes were to be disposed in a sanitary landfill. (EERC00044)

It is unfortunate that the EPA chose to use TCLP as the test for evaluating wastes from FFC. It has been demonstrated and it is well known that many FFC wastes, especially alkaline types from combustion of lower-rank coals or from advanced coal combustion processes such as fluid-bed combustion, undergo chemical and mineralogical transformations upon contact with water. One important mineral that is often formed during the hydration of alkaline or lower-rank CCBs is the mineral ettringite ... If the proper concentrations of components are provided along with high alkalinity, ettringite forms readily. These conditions are often met when low-rank CCBs contact water. The ash in most cases has all of the potential ingredients for ettringite formation and it has

been found that many low-rank CCBs do form ettringite as a primary hydration product ... A short-term leaching test of 18-hour duration such as the TCLP or American Society for Testing and Materials (ASTM) water shake test may be concluded before ettringite has even begun to form in some CCBs. This could result in highly misleading information regarding leachability of several very important and potentially problematic trace elements. Since these transformations can chemically fix certain trace elements, particularly those that exist in aqueous solution as oxonians such as arsenic, boron, chromium, molybdenum, selenium, and vanadium, and because these chemical and mineralogical transformations can take up to months, TCLP is clearly an inappropriate test for evaluation of wastes from FFC in monofills. (EERC00044)

Alternative tests to the TCLP exist that are more appropriate. One of these, the ASTM shake extraction, and another, the synthetic groundwater leaching procedure (SGLP) developed at the University of North Dakota (Hassett, 1987), can provide more relevant data, especially if leachate concentrations are measured over time periods of up to 2 months and greater. Potentially problematic trace elements, including those listed above, have been found to decrease in concentration over time (Hassett, 1991; Hassett, 1994). The use of an acetate-based short-term leaching is clearly inappropriate. Although the TCLP is appropriate for wastes in sanitary landfills, FFC wastes, often disposed in monofills, require a different approach. The argument that the TCLP, being acidic in nature, represents a worst-case scenario is also a fallacy. SGLP or ASTM leaching do not provide data that can be generally characterized as higher or lower in quality, but rather as more scientifically valid and legally defensible. Alternative and more scientifically valid procedures such as the EERC's SGLP and the ASTM shake extraction test are also in line with the performance-based measurement system (PBMS) approach to compliance monitoring recently initiated by EPA. Since leaching data on FFC wastes generated using TCLP or other short-term leaching tests may be flawed, care must be exercised in the application of these data for environmental impact projections or modeling. (EERC00044)

The toxicity characterization of the wastes relied on two tests, one of which the EPA's own Science Advisory Board in 1991 noted was inadequate. (49CAO00058)

Among the findings of the Boulding report, which was based on extensive literature review and analysis of coals burned in Indiana utilities (including Kentucky coals), that bear on the EPA assessment of the risks associated with coal combustion waste (CCW) disposal, are these ... Neither EP nor TCLP tests provide a good indication of leachability of CCW in natural disposal settings. Long-term leaching tests conducted until equilibrium has been achieved for each element of concern, using a leaching solution that approximated percolating groundwater, would give a more accurate depiction of ground-water contamination potential at a disposal site. (NCCLP00282)

Many of the elements they feel will be 'locked up' in the high pH of ashes for instance, in reality leach out easily at high pHs, as well as at the more acidic. (PEACE00306)

Certain commenters have attacked the TCLP test as a flawed methodology. TCLP was designed to approximate the behavior of metals in a typical landfill environment. TCLP reflects probable leaching characteristics in soil amendment application of coal ash. However, TCLP probably overstates the concentration of toxics in leachate from mine reclamation and minefilling, because the alkalinity of the FBC ash and its pozzolonic (cement-like) nature, combined with the compaction in the backfilling process, will decrease the mobility of metals significantly, in contrast to a landfill disposal. PG&E Gen has documented compaction densities in FBC ash reclamation projects that achieve permeability rates of less than  $10^{-6}$  cm/sec or better, approaching the permeability requirement for municipal solid waste landfill liners. (See also, attached geotechnical report for additional information on compaction density of FBC ash fill.) Thus, TCLP data most likely significantly overstates the actual leachability of toxics from FBC ash in the mine reclamation context. Equally important, TCLP is the bright line test for waste toxicity for all wastes and all uses established by EPA. That TCLP may not perfectly model leaching behavior in every waste and in every application is neither surprising nor relevant to this determination. (PG&E00274)

### **XIII. WASTE CHARACTERIZATION**

#### **E. Characterization of Mercury**

Several public interest group commenters suggested that EPA's characterization of mercury was inadequate, with some of the commenters suggesting the characterization failed to even test for mercury. The commenters found the lack of attention to mercury egregious in light of the perceived risks, the current attention to mercury throughout the Agency, and the high levels of mercury emissions from utilities.

Response: The Technical Background Document for the Report to Congress on Remaining Wastes from Fossil Fuel Combustion: Waste Characterization<sup>19</sup> does present characterization data on mercury. Specifically, leachate and/or porewater mercury data were presented in Tables 3-15 and 3-16 for comanaged wastes, Tables 3-18 through 3-23 for oil combustion wastes, and Tables 3-24 through 3-28 for FBC wastes. Whole waste mercury concentration data were presented in Tables 2-10 through 2-12 for oil combustion wastes and Tables 2-13 through 2-15 for FBC wastes. For comanaged wastes, only one site reported whole waste mercury concentration, a single sample below a detection limit of 0.13 milligrams per kilogram (mg/kg). EPA used these characterization data for mercury in its risk assessment as discussed below under Topic XIV.C.

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<sup>19</sup> FF2P-S0367.

**XIII. WASTE CHARACTERIZATION**  
**E. Characterization of Mercury**  
**Verbatim Commenter Statements**

EPA did not adequately characterize FFC wastes, including mercury releases. (ALA00036)

The waste characterization analyses fail to even test for mercury, or if they do, the report fails to present the data. If the data were available, it would be possible to calculate the mercury content of and mercury fluxes from the various wastes streams. (ALA00036)

It appears that the waste characterization analyses fail even to test for mercury. (49CAO00058)

EPA requested analyses for mercury, however the EPRI contractor did not collect or preserve samples for mercury analysis and none were done. (ALA00292)

In addition, the field sampling, as documented by SAIC did not follow the QAPP decontamination procedures, nor was the complete list of target analytes analyzed for (e.g., mercury and chromium (VI)). (ALA00292)

Mercury was not modeled in the human health assessment portion of the non-groundwater analysis. One reason for this is that mercury was not reported in the co-managed waste analytical data. This shortcoming is noted above in the waste characterization section - the EPRI contractor did not collect or preserve samples for mercury analysis although mercury is specified in the QAPP as a target analyte. (ALA00292)

### **XIII. WASTE CHARACTERIZATION**

#### **F. Characterization of Organics, Radionuclides, and Dioxins/Furans**

Public interest group and academic commenters argued that EPA's characterization data for organics, dioxins and furans, and/or radionuclides were inadequate and/or inadequately presented. Particularly, some of the commenters suggested that the characterization was insufficient to rule out these constituents from risk assessment. One of the commenters was particularly concerned about polycyclic aromatic hydrocarbons (PAHs) and phenols. Another commenter suggested that FBC wastes retain volatile and semi-volatile organics in the bottom ash to a greater extent than conventional pulverized coal combustion wastes.

Response: EPA based its characterization of organic constituents (including dioxins and furans) on the following sources:

- Inorganic and Organic Constituents in Fossil Fuel Combustion Residue, Volume 1: A Critical Review. Electric Power Research Institute. EP-5176. August, 1987.
- Development Document for Effluent Limitations Guidelines and Standards and Pretreatment Standards for the Steam Electric Point Source Category. EPA, Office of Water. EPA 44/1-82/029. November, 1982.
- PCDDs and PCDFs in Coal Combustion By-Products (CCBS). Final Report. Electric Power Research Institute. March, 1998.
- Organics data reported in the Fossil Fuel Fluidized Bed Combustion By-Products Survey electronic database provided by the Council of Industrial Boiler Owners.
- Organics data reported in the Oil Combustion By-Products Database provided by the Electric Power Research Institute.
- Letter to Dennis Ruddy, EPA, from James R. Lindsay, Florida Power and Light, transmitting analytical data for split samples at FPL's Riviera Facility. June 18, 1997.

Based on these sources, EPA concluded that organic constituents, including PAHs, are infrequently present in FFC wastes at levels above analytical detection limits. This conclusion is consistent with the expectation that organics are destroyed in the combustion process or pass out the stack. Given this conclusion, the Agency did not consider organics in its risk assessment. EPA also did not include a detailed summary of the organics characterization data from these sources in the docket, because any such summary would consist primarily of non-detects. EPA does not disagree that there is a possibility that FBC combustion conditions might result in wastes that retain organics to a greater extent than conventional coal combustion wastes. The analytical data for FBC wastes, however, still show that organic constituents are rarely present above analytical detection limits.

EPA based its characterization of radionuclides on a variety of sources, as discussed under Topic XI.A (see the report in the docket "*Review of Literature on Radionuclides in Fossil Fuel Combustion Wastes*"). To avoid duplication of effort with the more detailed study of radionuclides



in FFC wastes being conducted by the Office of Air and Radiation, the Agency did not consider radionuclides in its risk assessment or present a detailed summary of radionuclides data in the docket. EPA has reviewed radionuclide concentrations in coal and ash in connection with other regulatory programs (EPA1989a, 1989b, 1995c). One of these studies examined potential exposures of worker and nearby resident to radioactivity from ash released from a coal pile through wind and runoff erosion. Exposure from direct contact, inhalation, and ingestion were estimated to fall below natural background radiation exposure levels even for a worker standing on the ash pile (EPA, 1989a). In addition, EPA is currently studying coal combustion wastes as part of a larger study of naturally occurring radioactive materials (NORM). The report from this NORM study is expected to be published later in 2000. Due to the low expected risks associated with radionuclides in coal ash, and to prevent duplication of effort with the NORM study, EPA eliminated radionuclides from further consideration in this study.

### **XIII. WASTE CHARACTERIZATION**

#### **F. Characterization of Organics, Radionuclides, and Dioxins/Furans**

##### **Verbatim Commenter Statements**

Data are not presented in the Report on the analyses of the concentration of organic compounds or radioactive-substances in FFC waste; however, EPA determined that no public health concern exists from these potentially toxic constituents. It is particularly important that organic emissions, including dioxins/furans, that can be generated when coal is combusted with other materials such as tires, used oil, railroad ties, and sewage sludge (i.e. cobuming) be carefully considered in the risk assessment. EPA states on page 3-13 of the Executive Summary that “although an exhaustive review of the organics data has not been conducted, based on available information; total and leachable organics are generally reported to be at or below analytical detection limits.” (ALA00036)

Data on organic or radioactive substances in the wastes are not reported, although EPA concludes that they represent no human health risks. (49CAO00058)

As with PAH's the draft Determination relies on a few reports by third parties to dismiss the existence and environmental threat of radioactivity without sufficient justification. Dismissing the need to analyze for or monitor such constituents on financial or technical grounds is not valid. (HEC00332)

Considering the lack of testing or monitoring for phenols at other ash sites around the country , further consideration and study of the presence of phenols in CCW is needed. (HECL0014)

Fluidized bed combustion (FBC) wastes retain volatile and semi-volatile elements in the bottom ash to a greater extent than conventional pulverized coal combustion, thus enhancing the leachability of FBC waste elements. (NCCLP00282)

### **XIII. WASTE CHARACTERIZATION**

#### **G. Impacts of HAP/NO<sub>x</sub> Regulations**

Public interest group commenters argued that EPA had not considered the effect on waste characteristics of upcoming requirements under the Clean Air Act. The commenters suggested changes in air pollution control technology would cause metal concentrations in waste to increase.

Response: We have carefully considered the issue of cross-media impacts and the commenters' specific concerns that future air regulations could have an adverse impact on the characteristics of coal combustion wastes. We have concluded that it is premature to consider the possible future impact of such new air pollution controls on the wastes that are subject to today's regulatory determination. The Agency plans to issue a regulatory determination in the latter part of 2000 regarding hazardous air pollutant (HAP) controls at coal-burning, power generating facilities. If EPA decides to initiate a rulemaking process, final rulemaking under the Clean Air Act is projected to occur in 2004. Thus, no final decision has been made on what, if any, constituents will be regulated by future air pollution control requirements. Additionally, the regulatory levels of the those specific pollutants that might be controlled and the control technologies needed to attain any regulatory requirements have not yet been identified. Therefore, we believe there is insufficient information at this time for evaluating the characteristics and potential environmental impacts of solid wastes that would be generated as a result of new Clean Air Act requirements.

When any rulemaking under the Clean Air Act proceeds to a point where we can complete an assessment of the likely changes to the character of coal combustion wastes, we will evaluate the implications of these changes relative to today's regulatory determination and take appropriate action.

**XIII. WASTE CHARACTERIZATION**  
**G. Impacts of HAP/NO<sub>x</sub> Regulations**  
**Verbatim Commenter Statements**

Nor has EPA taken into account the anticipated increases in metal concentrations of pollution control wastes associated with upcoming requirements promulgated under the Clean Air Act. (EDF00021)

The Report and its risk assessments do not address the changing characteristics of fossil fuel wastes that may result from attempts to comply with new air pollution control standards. For example, there is no discussion of the effects of installing controls for nitrogen oxides on the character of the coal combustion waste that would be produced by utility coal-fired power plants and its potential for harming the environment. With more time to comment we hope to submit a detailed analysis of the risk assessments done for this Report. (HEC00056)

Currently, there is a growing nationwide movement to place mercury emission controls on coal-fired plants. If these controls are enacted, mercury concentrations will rise in CCW as more mercury is retained in the ash. Without responsible CCW disposal standards, emissions standards will not prevent mercury contamination from degrading the environment. We will only be changing the pathway by which it enters our streams and lakes. The impacts of mercury from CCW and higher concentrations of mercury in CCW created by mercury emission controls needs to be further studied by EPA. (HEC00332)

### **XIII. WASTE CHARACTERIZATION**

#### **H. Characterization of Mill Rejects**

One industry commenter contended that the Report's statement that coal mill rejects could "potentially" be reactive is mistaken because coal mill rejects do not emit any gases and fumes.

Response: The Agency has not conducted a detailed evaluation of mill rejects with regard to the RCRA characteristic of reactivity. EPA's primary concern with mill rejects is that, if not properly managed, their pyritic component has the potential to generate acid that can mobilize constituents in comanaged wastes. This concern is addressed under Topic IV, above.

**XIII. WASTE CHARACTERIZATION**  
**H. Characterization of Mill Rejects**  
**Verbatim Commenter Statements**

EPA's speculation that coal mill rejects could "potentially" be reactive is mistaken. This potential in fact is nonexistent because coal mill rejects do not emit any gases and fumes. EPA should correct this misstatement in the final regulatory determination. (USWAG00037)

### **XIII. WASTE CHARACTERIZATION**

#### **I. Sampling and Analysis Quality Assurance**

One public interest group commenter stated that sampling, handling, and analysis procedures utilized by the industry contractor performing the waste characterization analysis did not conform to EPA's protocols adopted for the study, and potentially biased the outcomes.

General Response: EPA acknowledges that there were certain deviations from the procedures specified in the Quality Assurance Project Plan (QAPP) at three sites where EPA performed verification sampling in conjunction with industry sampling efforts. The Agency notes, however, that these deviations were noted only at three sites, not at all of the sites sampled by the industry. Furthermore, EPA compared the results of the industry sampling at these sites to its own analytical results from split samples at these sites. As documented in the docket,<sup>20</sup> EPA found a high degree of comparability between the EPA and EPRI results, suggesting that the data are valid and representative. Finally, many of the deviations from QAPP procedures noted, if significant, would tend to overestimate, not underestimate, contaminant concentrations. Thus, EPA does not believe that the minor deviations in procedures found at three sites are sufficient basis to invalidate the representativeness and conservatism of the characterization of FFC wastes used in this study. Specific problems with data collection and analysis cited by the commenter are identified in the numbered items below, with specific responses to each item.

1. At the FP&L site, no field quality control samples were taken and there was no decontamination of equipment.

Response: Field quality control samples were taken and equipment decontamination was conducted at the FP&L site. The commenter's concern appears to be based on a misinterpretation of the information presented in a memorandum describing the field activities at the site. The statements in this memorandum were intended to indicate that there were no issues noted with the field quality control samples and equipment decontamination, not that these activities were not conducted. The Agency apologizes if the presentation of the information was unclear.

2. At three other sites, field blanks were used as both field blanks and equipment blanks.

Response: Chapter One of EPA's "Test Methods for Evaluating Solid Waste SW-846" does not specifically recommend the inclusion of field blanks in the suite of field QC samples. SW-846 does, however, recommend the use of equipment (rinse) blanks. The blanks in question were useful as equipment blanks because each water sample was collected after it passed through or over (i.e., rinsed) the sampling equipment. The Agency's own QAPP for the verification

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<sup>20</sup> FF2P-S0092. Memorandum to Dennis Ruddy, EPA, Regarding Corrected Final EPA/EPRI Analytical Data Assessment and Comparison. Ray Anderson and Chris Long, SAIC. August 13, 1997.

sampling effort did not call for the use of field blanks, and we are not concerned about the lack of field blanks in the verification sampling effort.

3. Reagent grade water was not used for blank water; locally purchased distilled water was used instead at two sites.

Response: Reagent grade water is preferred for use as blank water because the quality of the water is known prior to its use. While quality of the locally-purchased distilled water was not known in advance, the sample analysis results for the blanks indicate that the water was of adequate quality for its intended use. For example, constituents of concern (As, Se, Cr, and Fe) were not detected at or below the reporting limit in any of the field/equipment blank samples with the exception of chromium which was detected in two of the blanks at concentrations just greater than the detection limits.

4. At three other sites, the EPRI team failed to perform equipment decontamination in accordance with the EPRI work plan.

Response: The deviations in equipment decontamination procedures noted could cause the sample analysis results to be biased high (i.e., increase the concentration of contaminants in the sample) if the procedure failed to remove chemical or material contamination from the sampling equipment. The sample analysis results for the field/equipment blanks indicate most constituents of concern were either not detected or detected at concentration near the detection limits for the constituents of concern in the blanks. The Agency notes that even if the deviations from the decontamination procedures did introduce bias, such bias would only result in an overestimate, rather than underestimate, of contaminant concentrations thus leading to a more conservative (i.e., erring on the side of safety) waste characterization for the three sites.

5. The samples for iron speciation were preserved incorrectly, therefore rendering useless the speciation analysis for iron.

Response: EPA acknowledges that, because of issues with the sample preservation, its contractor laboratory (Columbia Analytical) did not perform iron speciation analyses. This lack of iron speciation data, however, had no significant impact on EPA's waste characterization, as iron speciation was not considered as part of the risk assessment.

6. The sample volume collected by the EPRI contractor for sample splits was only 200 : L, rather than the typical 5 liter volume required to obtain the lowest achievable detection limits and the standard quality assurance analyses of duplicate and spike samples. Neither the EPRI contractor nor EPA's independent contractor could perform all of the quality assurance procedures, because the small sample size collected by the EPRI contractor precluded the analysis of duplicate or spike samples.



Response: Because EPA substituted  $\frac{1}{2}$  the detection limit for analyses reported to be below a detection limit, the inability to obtain the lowest achievable detection limits would result in an overestimate of contaminant concentrations, except in cases where the actual concentration was greater than  $\frac{1}{2}$  the achieved detection limit and greater than the lowest achievable detection limit. Because this concern applies only in these cases and only at three sites, the effect on EPA's overall characterization is not likely to be significant.

EPA's analysis of field duplicates for the three sites indicated that the laboratory analytical systems were operating efficiently and could effectively reproduce the sample concentrations. Therefore, the inability to perform all the analyses of duplicate and spike samples is not a major concern.

7. The EPRI contractor lab had detection limits for 8 metals that were between 25 and 10,000 times higher than the independent EPA lab. This discrepancy cannot be explained, as both labs used identical procedures.

Response: In response to EPA's concerns about the differences between detection limits, the industry contractor lab (Battelle) provided an explanation for the differences. The difference appears to be based on methodology used to determine the detection limit. Battelle detection limits are set based on analyses of standard samples where the repeated analyses of lowest standard produces a large variability in measure concentrations (25 to 50 percent), as opposed to using high concentration standards. Furthermore, most of the positive results reported by the EPA contractor lab (Columbia Analytical), where Battelle reported results below the detection limit, should be considered trace level concentrations that were slightly above the Columbia detection limit. Therefore, given the very good agreement between results from the two labs overall, EPA does not consider the difference in detection limits to be a critical concern. As discussed above, given EPA's characterization methodology, the higher detection limits are more likely to result in conservative estimates of concentration (i.e., overestimates).

**XIII. WASTE CHARACTERIZATION**  
**I. Sampling and Analysis Quality Assurance**  
**Verbatim Commenter Statements**

For example, the record demonstrates that EPA was/is aware (as documented in various memoranda in the docket) that data sampling, handling, and analysis procedures utilized by the industry contractor performing the waste characterization analysis did not conform to EPA's protocols adopted for the study, and potentially biased the outcomes. (ALA00292)

In the course of this work our consultants discovered that the Agency was aware of serious flaws in the data collection and analyses underlying the Report and the Regulatory Determination, but chose to go ahead despite these issues. (ALA00292)

In fact, numerous data collection and analysis problems are documented by SAIC in the record underlying the Report to Congress. It is clear that the sample collection and analysis activities did not meet the data quality objectives outlined in the QAPP, as set forth in more detail below. This calls into question the quality and accuracy of the results of the waste characterization analyses. Two memoranda to the docket document the site visits to the four power plants. Both memoranda point out problems with the field activities. At the FP&L site, no field quality control samples were taken and there was no decontamination of equipment. At the other three sites, more serious problems were observed by SAIC as summarized below:

- Field quality control samples. Field quality control samples differed from those specified in the EPRI work plan and the QAPP. Field blanks were used as both field blanks and equipment blanks, an approach that differs from EPA guidance. Also, reagent grade was not used for blank water; locally purchased distilled water was used instead at two sites.
- Equipment decontamination. The EPRI team failed to perform equipment decontamination in accordance with EPRI work plans...
- Iron speciation. The samples for iron speciation were preserved incorrectly, therefore rendering useless the speciation analysis for iron.
- Sample volume. The sample volume designated by the EPRI contractor for sample splits was only 200 ml, rather the typical 5 liter volume required to obtain the lowest achievable detection limits and standard quality assurance analyses of duplicate and spike samples. (ALA00292)

Neither the EPRI contractor nor EPA's independent contractor could perform all of the quality assurance procedures, because the small sample size collected by the EPRI contractor precluded the analysis of duplicate or spike samples. Furthermore, with regards to the duplicate samples that were analyzed by the Independent laboratory, the EPRI contractor lab had detection limits for 8 metals that were between 25 and 10,000 times higher than the independent lab. (This discrepancy cannot be explained, as both labs used identical procedures). The result of this is that the EPRI

contractor reported non-detectable concentrations for the eight metals, compared to positive concentrations reported by the independent lab ... In summary, our review of the QAPP requirements for this project, and other docket materials reveals that the sampling methods and the analyses performed on the waste samples do not meet the data quality objectives in at least the following areas: accuracy, precision, and completeness. In addition, the field sampling, as documented by SAIC did not follow the QAPP decontamination procedures, nor was the complete list of target analytes analyzed for (e.g., mercury and chromium (VI)). (ALA00292)

### **XIII. WASTE CHARACTERIZATION**

#### **J. Filtration of Samples**

One public interest group commenter expressed concern with the filtration of ground-water and low-volume waste samples at three sites, and the filtration of ground-water and porewater samples at another site. The commenter stated that the filtration performed by the industry contractor in these cases was inconsistent with EPA guidance and likely to bias the results low.

Response: EPA initially expressed concern with the filtration of samples early on in the study process. In response, EPRI conducted a study of the effects of filter pore size on observed concentrations at the sites where filtration was conducted. This study is included in the docket.<sup>21</sup> This report compared concentrations in 0.0007 : m filtrates with those in 0.45 : m filtrates and found that in almost all samples the percentage difference between the observed concentrations in the two different filtrates was far less than 25 percent and within the experimental error. Based on these results, EPA does not believe that the filtration of samples biased the results low.

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<sup>21</sup> FF2P-S0048. Effect of Pore Size of Filters on the Observed Aqueous Concentrations in Filtrates. Draft Report. EPRI. June, 1997.

**XIII. WASTE CHARACTERIZATION**  
**J. Filtration of Samples**  
**Verbatim Commenter Statements**

At the other three sites, more serious problems were observed by SAIC as summarized below ...

- Filtration of ground water samples. The field procedures observed were inconsistent with EPA guidance recommending against the filtration of ground water samples prior to analysis for metals (although consistent with EPRI work plans). The aggressive filtration step used by the EPRI contractors for the groundwater samples is likely to bias the results low, so that the metals concentration detected may not represent the total mobile contaminant loading on the aquifer.
- Filtration of aqueous waste samples. EPRI contractors pressure filtered all low volume waste samples. This approach is inconsistent with EPA methodologies. SAIC expressed concern that filtration to this extent could bias the results low because mobile contaminants associated with colloid-sized particles would be concluded from the analysis.  
(ALA00292)

The filtration issue is critically important and is reiterated by SAIC in a different memorandum to EPA regarding a draft EPRI site report. In that memorandum, SAIC writes that the most significant concern regarding the data in the report relates to the 3.6 nanometer filtration step performed on porewater samples and ground water samples.

Filtration to this level will remove porewater components capable of movement through the groundwater, In short. SAIC states that the porewater samples and groundwater samples may be expected to consistently underestimate the metals concentration and will lead to an underestimation of the contribution of the waste unit leachate to the surrounding groundwater. (ALA00292)

**XIII. WASTE CHARACTERIZATION**  
**K. Characterization of Chromium VI**

One public interest group commenter stated, although EPA requested data for the hexavalent species of chromium, the industry failed to provide this data, and that the characterization and risk assessment therefore failed to adequately consider chromium.

Response: The commenter is correct that speciated data were not available for chromium. Ample data, however, were available on total chromium concentrations. To account for the lack of speciated data, EPA's risk assessment made the conservative assumption that all chromium present was in the more toxic hexavalent state. Thus, the characterization and risk assessment adequately and conservatively considered chromium.

**XIII. WASTE CHARACTERIZATION**  
**K. Characterization of Chromium VI**  
**Verbatim Commenter Statements**

EPA requested analysis for chromium (VI) however the EPRI contractors did not collect these samples. (ALA00292)

In addition, the field sampling, as documented by SAIC did not follow the QAPP decontamination procedures, nor was the complete list of target analytes analyzed for (e.g., mercury and chromium (VI)). (ALA00292)





#### **XIV. RISK METHODOLOGY IN GENERAL**

A number of commenters expressed concern about the methodology used by EPA in the risk assessment process. Specific concerns included the level of conservatism inherent in the methodology, the specific constituents considered, the methodology for considering risks to children, the selection of toxicity benchmarks, the specific values used for arsenic toxicity, the use of site averaging and inclusion of data from certain sites in selecting source terms, and the adequacy of coordination between various parts of the risk assessment. These concerns are all addressed below.

The focus in these comments was on risk modeling, not on the overall weighing of modeling, state programs and damage cases in the final risk characterization underlying today's decision. EPA wishes to point out, again, that groundwater modeling was not used as a basis for today's decision; yet, in an effort to clarify certain questions below address many groundwater modeling related issues.

Response: EPA believes its overall risk modeling methodology was appropriately protective (errring on the side of safety), based on state-of-the-art science, and adequately coordinated and fully peer reviewed. Four peer reviewers examined those aspects of the risk assessment within their areas of expertise. EPA believes it appropriately considered all of the constituents of greatest concern based on the available characterization data. EPA believes it appropriately selected toxicity benchmarks and that its use of site averaging, described in Section XIV.G below, was reasonable and appropriate. The Agency agrees that there is substantial uncertainty surrounding the values used for arsenic toxicity, but believes it applied values based on the best available current scientific knowledge (See Sections VIII and XIV.F below.) These and other specific concerns raised by the commenters with regard to risk assessment methodology are addressed in more detail in the sub-topic responses below.

The essence of this section is that EPA received comment that we both over- and underestimated risk in our risk modeling. EPA used the data available and conducted risk modeling in accordance with practices developed for past rulemakings. It is important to note here that EPA is reviewing its groundwater model in response to specific comments. We have not yet reached conclusions based on our review. If this review warrants, groundwater risk modeling will be revisited. Specific comments are addressed below.

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **Verbatim Commenter Statements**

It appears that EPA's modeling effort has created, in EPA's attempt to be conservative, an unrealistic scenario for the use of FBC ash. The extreme conservatism has resulted in the application of unreliable, mutually exclusive data that, on occasion, results in scenario parameters that break basic scientific principals. Selecting the input parameters more carefully in order to more realistically represent even extreme conditions for managed FBC ashes should dramatically change the outcome of the Report and position of the EPA on FBC ash. (ARIPPA00019)

There seems to be some concern with regard to the actual assumptions that went into assigning the toxicity to arsenic that clearly needs to be evaluated. (ARIPPA00019)

The risk analyses undertaken thus far regarding FFCW are grossly inadequate. The methodologies employed to date involved incomplete and/or invalid data and risk modeling, resulting in substantial understatements of actual and potential risks. (EDF00021)

Key deficiencies include the following ... methodology used to estimate potential risks via the groundwater pathway which systematically and substantially understates such risks due to reliance on TCLP data for highly alkaline wastes, the use of facility-averaged TCLP data instead of actually measured high-end values, and myriad technical deficiencies identified in the modeling itself. (EDF00021)

The EPACMTP's risk assessment model significantly overestimates the risk to human health theoretically presented by potential releases from combustion ashes into the environment. (PG&E00023)

Moreover, as demonstrated in the bulk of the testimony delivered at the agency's May 21 public hearing on the Report, these results would occur despite the fact that the agency's risk analysis seriously overstates the alleged risk from arsenic in CCPs. (NMA00024)

PCA shares the US Department of Agriculture's concerns about the risk assessment methodologies and assumptions used by EPA in evaluating risks. (PCA00034)

The assumption used in the exposure assessment and toxicity assessment could significantly underestimate the quantitative risk estimates reported by EPA. (ALA00036)

Unfortunately, the overly conservative assumptions and simplified modeling methodologies resulted in numerical risk estimates that do not comport with real world observations. (USWAG00037)

In 1997 USWAG commented on EPA's proposed risk analysis methodology for the Phase II Beville study, and in 1998 USWAG commented in detail on the "revised draft final" groundwater pathway risk assessment. Those comments sounded three consistent themes: (1) EPA should utilize the wealth of real world data to the fullest extent possible; (2) when modeling is necessary, EPA should avoid excessively conservative assumptions that undermine the validity of its conclusions; and (3) EPA should validate its modeling results by comparison with real world data. USWAG's previous criticism of EPA's modeling-based risk assessment remain valid, and we incorporate them here in full. (USWAG00037)

The EPA expressed concern regarding the groundwater pathway risk associated with arsenic from the land disposal of comanaged FFC wastes from coal-fired utilities. USWAG comments provide detailed, technical information demonstrating the risks are overstated by several orders of magnitude. Reiteration of the technical arguments is unnecessary. However, APS strongly agrees with USWAG's position (APSC00043)

The methodology used in the risk assessment that is based on EPACMTP modeling, is fundamentally flawed. There are errors of logic, of implementation, of programming, and simple quality control. These errors almost universally understate risks. Even under the conditions that the Agency purportedly models, the modeling undercalculates by orders of magnitudes the risks from FFCW. (HEC00056)

Omissions and errors in the draft RTC which combined to overstate calculated risks for agricultural uses of coal ash by several orders of magnitude. The underlying assumptions used in this risk analysis appear to be substantially more conservative than assumptions used in previous health risk analyses performed by the EPA for other materials. EPA must maintain a consistent, objective basis in evaluating health risks for the public...The EPA health risk analysis assumed questionable values for ... arsenic cancer slope factor & reference dose. (NSP00057)

The risk assessments are not adequate. There are several ways in which the risk assessment and exposure analyses contained in the Report are inadequate and inconsistent with Agency policy. (49CAO00058)

Moreover, as demonstrated in the bulk of the testimony delivered at the agency's May 21 public hearing on the Report, these results would occur despite the fact that the agency's risk analysis seriously overstates the alleged risk from arsenic in CCPs. (WVDEPL0003)

Choice of values for the variables in the risk equations is often difficult due to uncertainties in the distribution of these values in the environment or exposed population. "Conservative" values are often chosen in order to adequately protect the greatest proportion of the exposed population; however, when "conservative" values are used for most or all of the variables in the equation, the multiplicative effect is to generate very large cancer risk that can only represent a minute

percentage of the actual population exposed. This in essence represents a multiple high-end scenario that is not consistent with accepted risk assessment practice. (PHS018)

EPA's risk assessment model, which projected a remote health risk potential for arsenic through groundwater, used assumptions that we believe overstated the actual risk. (PG&E00274)

PG&E Gen's initial comments included risk assessment criticism of EPA's model and assumptions that were used to generate the remote risk to human health for arsenic from agricultural use of FBC coal ash. PG&E Gen's review identified numerous problems that cause the model to overestimate the potential risk presented by this beneficial use of coal ash, such as ... use of unrealistic toxicity factors from a highly criticized health risk study. Other commenters to the docket have criticized EPA's risk assessment model as flawed in ways alleged to understate the actual risks presented. (PG&E00274)

EPA's groundwater risk assessment does not under-predict concentrations of metals in groundwater. As USWAG documented in its initial comments, EPA's groundwater risk analysis is based upon compound and overly conservative assumptions that over-estimate risk by orders of magnitude. USWAG's initial comments, combined with the wealth of field data in the record, provide the basis for EPA to reevaluate its modeling exercise, reduce its risk estimates by orders of magnitude, and validate those results. At this time, USWAG finds it necessary to provide additional comment on EPA's risk modeling to specifically address comments filed by the Environmental Defense Fund (EDF). Those comments allege that EPA's modeling under-predicts concentrations of contaminants. However, those views are not based upon a plausible scientific foundation and do not stand up to simple field validation. (USWAG00275)

There are significant deficiencies in each of the steps in EPA's assessment of the human health impacts of current FFC waste disposal practices. (ALA00292)

Additionally, recent data from University of Tennessee and Wright Patterson Air Force Base's School of Engineering (OH) show that concentrated wastes may increase health concerns outside of the water quality arena, such as radon emissions ... Again, additional data exploring all aspects of this issue need to be further examined. (PURD00294)

We urge the agency to take this lead threat to the public health just as seriously as you have lead paint in the past. We keep hearing from the industry side about 'sound science.' Where is the soundness in a so-called 'science' that would raise lead action levels by several magnitudes? (PEACE00306)

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **A. Response to Peer Review Comments**

Several commenters expressed concern that EPA had not adequately addressed peer review comments on its draft risk assessment. One of these commenters specifically referred to peer review comments about the bias in using industry-provided data.

Response: EPA believes the peer review conducted for the draft risk assessment was complete and appropriate to this task. Four skilled peer reviewers were involved. Modeling methodology, with the exception of the MINTEQA2 component of EPACMTP, had been previously peer reviewed, and a request for MINTEQA2 SAB review has been received in context of the ongoing critique of EPACMTP, noted below under Topic XV. Comments about the potential bias of industry-provided data are addressed under Topic XIII.B.

Peer reviewers in general requested more explicit modeling treatment of variables for which considerable uncertainty existed. This was done, as detailed in the docket, for both the groundwater and above ground pathways and in official response to comment. In some cases, key input variables were held at 3-5 times reported values, with the result that, for this one speculative change, risk changed proportionately. (Eg 3 times  $2 \times 10^{-4} = 6 \times 10^{-4}$ ). However, very little may be inferred from such analyses as to the likelihood of occurrence and its importance in a multivariate setting. One peer reviewer expressed concern that EPA do a more thorough ecological risk assessment, but EPA was constrained in this regard by resources and believed that resources were better spent on human health risk assessment. Aside from adjusting for the sheer volume of FFC wastes, there was little new in the risk modeling methodology for today's rulemaking.

**XIV. RISK METHODOLOGY IN GENERAL**  
**A. Response to Peer Review Comments**  
**Verbatim Commenter Statements**

The peer reviewers for the human health and ecological risk assessment offered a number of valuable suggestions. While a summary of the comments is included in the docket, there is no indication that comments were either used to revise the assessment or considered in the Report to Congress. (ALA00036)

This Report is based almost entirely on data provided by industry strongly suggesting the possibility of conflict of interest. One of the Report's peer reviewers pointed out this problem, noting the potential for bias, however it is not apparent anywhere that EPA took action based on the reviewer's comment. (49CAO00058)

## **XIV. RISK METHODOLOGY IN GENERAL**

### **B. Level of Conservatism**

Industry, academic, and state government commenters expressed concern that, because they combine numerous conservative (protective) assumptions, EPA's modeling results exaggerate the degree of risk. Several of these commenters found the risk assessment for arsenic in particular to be unrealistically conservative.

In contrast, several public interest groups stated that errors in assumptions and study design resulted in gross underestimation of risk. One of these commenters stated that the assessment did not assess above average exposure conditions and risks to sensitive populations because EPA used central tendency values for all the driving parameters.

Response: Central tendency and deterministic high-end analyses were performed for the risk assessment. For the central tendency risk estimation, all parameters are set to their central tendency value and the risk or hazard quotient for each constituent is calculated. The high-end risk estimation uses a double-high-end assessment methodology, consistent with EPA Office of Solid Waste past risk assessments. With this approach, two parameters at a time are set to their high-end value while the remainder of the parameters are set at central tendency, and risk values are calculated. Another combination of parameters is then set at their high-end values while the remainder are set at central tendency, and this set of results is calculated. This continues until risk values are calculated for all possible high-end parameter combinations. Therefore, only two variables are set to their high-end values for any particular run. The above was done for all sensitive and exposed sub-populations, including children in general and children of a farmer.

The FFC assessment was national in scope because the thousands of facilities with widely varying characteristics covered by the study are located throughout the country. Site specific parameter inputs values were not feasible. Given the uncertainty about characteristics of facilities and waste management units, conservative assumptions concerning parameter values are necessary to ensure protection of human health and the environment. EPA believes that the values that were used were reasonable given the high degree of variability that can be expected across the industry. The risk assessment for arsenic was no more nor less conservative than the risk assessment for all other chemicals. Comments on more specific assumptions regarding arsenic are discussed under Topics XIV.F and XVI.B.

Specific comments about exposure assumptions and sensitive populations are discussed in Section XV.

**XIV. RISK METHODOLOGY IN GENERAL**  
**B. Level of Conservatism**  
**Verbatim Commenter Statements**

It appears that EPA's modeling effort has created, in EPA's attempt to be conservative, an unrealistic scenario for the use of FBC ash. The extreme conservatism has resulted in the application of unreliable, mutually exclusive data that, on occasion, results in scenario parameters that break basic scientific principals. Selecting the input parameters more carefully in order to more realistically represent even extreme conditions for managed FBC ashes should dramatically change the outcome of the Report and position of the EPA on FBC ash. (ARIPPA00019)

As discussed in this section of the comments, the groundwater modeling conducted by EPA grossly understated the risks posed by fossil fuel combustion wastes. This understatement is the result of a series of methodological flaws which individually would be significant, but when considered together, lead to profoundly invalid results. (EDF00021)

The EPACMTP's risk assessment model significantly overestimates the risk to human health theoretically presented by potential releases from combustion ashes into the environment. The model's assumptions do not reflect the current scientific knowledge regarding the behavior of the model, using arsenic as an example, but with general applicability to other potential contaminants. Inputs to the model are overly conservative a, therefore they substantially overestimate the potential for health risk. Adual data collected by EPA and industry fail to show any evidence of harm to the environment or public health, which is confirming evidence of the overstatement of potential risk by the models. (PG&E00023)

EPA estimates potential risks associated with fossil fuel combustion wastes throughout the Report that are based on a risk assessment for ground-water pathway human health and above-ground multi -pathway human health and ecological risk assessment. Both of these risk assessment models are overly conservative and likely over estimate actual risks, Therefore, the results of these risk assessments should not be used as the basis for public policy decisions with respect to risks from fossil fuel waste products. (PG&E00023)

Therefore, the risk assessment methodology used in this risk assessment overstates the potential risks to human health or to the environment. This is futher supported by the fact that EPA has not found documentation of actual harm or significant releases of toxins such as arsenic despite considerable experience and monitoring of these practices. (PG&E00023)



Moreover, as demonstrated in the bulk of the testimony delivered at the agency's May 21 public hearing on the Report, these results would occur despite the fact that the agency's risk analysis seriously overstates the alleged risk from arsenic in CCPs. (NMA00024)

Indeed, the risk assessment employed by EPA for the 1999 Report to Congress is fatally flawed, thus greatly overstating the risk. (NMA00024)

The assumption used in the exposure assessment and toxicity assessment could significantly underestimate the quantitative risk estimates reported by EPA. (ALA00036)

Because the concentrations of chemicals in FFC waste are suspect, the exposure estimates are also suspect. As a result, the analysis could underestimate risks, especially to populations with above average exposures. (ALA00036)

The exposure parameters are based on central tendency values for such factors as ingestion rates, and residence time and, therefore, do not account for above-average exposures. (ALA00036)

There are several assumptions and uncertainties in the risk assessments that could underestimate the risk estimates cited in the Report. (ALA00036)

EPA has failed to conduct the human health risk assessment according to Agency guidelines and policies to ensure that above average exposure conditions and risks to sensitive populations are addressed. EPA used central tendency values for all the driving parameters in the risk assessments - starting waste concentration, size of unit, exposure duration, and distance to receptor. (ALA00036)

By using extremely conservative assumptions in the model that fail to mimic real world conditions, the model produces exaggerated risk conclusions divorced from reality and ceases to be a tool for sound regulatory decision-making. (USWAG00037)

To the extent that EPA has based recommendations against further regulatory action on the risk assessment results, those recommendations are sound because the modeling skewed the analysis towards overly conservative predictions and the Agency quite properly discounted the inflated risk numbers. However, in the few instances where EPA relied on the risk assessment to justify consideration of additional regulation, the flawed assumptions and analysis fatally undermine the risk assessment as a tool for regulatory decisionmaking. (USWAG00037)

Not only did EPA neglect the wealth of real world data in favor of a model that is ill-equipped to simulate the conditions occurring in FFC waste landfills and surface impoundments, but the Agency modeled conditions that are too far removed from reality to form a defensible foundation for regulatory action. Conservative assumptions may well have their place in policymaking where

there is irreconcilable. But, where uncertainty can be reduced by reference to observational data, such conservative assumptions no longer are justified. Furthermore, the compound effect of numerous simultaneous conservative assumptions must be avoided if the modeling results are to have any basis in reality. In both the groundwater and non-groundwater pathway risk assessments, EPA selected overly-conservative assumptions for numerous key parameters, compounding errors by orders of magnitude. The results of that effort show that arsenic risk potential exceeds conservative protective levels by two orders of magnitude in the worst case scenario. Those results are merely noise generated by the extremely conservative assumptions and are indefensible. (USWAG00037)

The modeling incorporated numerous overly conservative and technically inappropriate assumptions including the questionable application of pore water data. (APSC00043)

The risk assessment that models the fate and transport of contaminants in ground water dramatically and falsely understates the real risks that are occurring from disposal of fossil fuel wastes. The methodology used in the risk assessment that is based on EPACMTP modeling, is fundamentally flawed. There are errors of logic, of implementation, of programming, and simple quality control. These errors almost universally understate risks. Even under the conditions that the Agency purportedly models, the modeling undercalculates by orders of magnitudes the risks from FFCW. (HEC00056)

Omissions and errors in the draft RTC which combined to overstate calculated risks for agricultural uses of coal ash by several orders of magnitude. The underlying assumptions used in this risk analysis appear to be substantially more conservative than assumptions used in previous health risk analyses performed by the EPA for other materials. EPA must maintain a consistent, objective basis in evaluating health risks for the public. (NSP00057)

The exposure and risk assessments seemingly do not represent a "high-end" analysis, but rather represent averaged data. (49CA00058).

Moreover, as demonstrated in the bulk of the testimony delivered at the agency's May 21 public hearing on the Renort, these results would occur despite the fact that the agency's risk analysis seriously overstates the alleged risk from arsenic in CCPs. (WVDEPL0003)

Choice of values for the variables in the risk equations is often difficult due to uncertainties in the distribution of these values in the environment or exposed population. "Conservative" values are often chosen in order to adequately protect the greatest proportion of the exposed population; however, when "conservative" values are used for most or all of the variables in the equation, the multiplicative effect is to generate very large cancer risk that can only represent a minute percentage of the actual population exposed. This in essence represents a multiple high-end scenario that is not consistent with accepted risk assessment practice. (PHS018)

EPA's risk assessment model, which projected a remote health risk potential for arsenic through groundwater, used assumptions that we believe overstated the actual risk. (PG&E00274)

PG&E Gen's initial comments included risk assessment criticism of EPA's model and assumptions that were used to generate the remote risk to human health for arsenic from agricultural use of FBC coal ash. PG&E Gen's review identified numerous problems that cause the model to overestimate the potential risk presented by this beneficial use of coal ash. (PG&E00274)

EPA's groundwater risk assessment does not under-predict concentrations of metals in groundwater. As USWAG documented in its initial comments, EPA's groundwater risk analysis is based upon compound and overly conservative assumptions that over-estimate risk by orders of magnitude. USWAG's initial comments, combined with the wealth of field data in the record, provide the basis for EPA to reevaluate its modeling exercise, reduce its risk estimates by orders of magnitude, and validate those results. At this time, USWAG finds it necessary to provide additional comment on EPA's risk modeling to specifically address comments filed by the Environmental Defense Fund (EDF). Those comments allege that EPA's modeling under-predicts concentrations of contaminants. However, those views are not based upon a plausible scientific foundation and do not stand up to simple field validation. (USWAG00275)

EPA used numerous assumptions in the risk assessment that are overly conservative and conflict with scientific research. (USWAG00275)

The Report's use of questionable waste characterization data (which are at the heart of any analysis of whether or not to regulate as a hazardous waste) suggests that EPA's quantification of human health risks associated with exposure to groundwater contaminated with FFC waste is uncertain and likely underestimated. (ALA00292)

There are significant deficiencies in each of the steps in EPA's assessment of the human health impacts of current FFC waste disposal practices. The cumulative effect of these deficiencies indicates that EPA has underestimated the human health impacts associated with exposure to FFC wastes, particularly to individuals with above-average exposures. (ALA00292)

Based on a comparison of the values used by EPA in the ground water risk assessment and the values representing the 90th percentile for the U.S. population, it is apparent that EPA has not evaluated the high-end reasonable exposures. (ALA00292)

## **XIV. RISK METHODOLOGY IN GENERAL**

### **C. Constituents Considered**

Several public interest group and academic commenters expressed concern that EPA did not consider specific constituents in the risk assessment or questioned the methodology used to characterize and assess certain constituents. Several commenters expressed concern that EPA did not consider mercury in the risk assessment.

Other specific constituents about which the commenters expressed concern are identified in the numbered items below, with specific responses to each concern.

Response: The data provided to EPA contained only inorganics. The risk assessment did not initially consider secondary parameters (i.e., parameters for which only secondary MCL's exist) because these parameters are of concern mainly for non-human health ground-water impacts (e.g., taste, smell, appearance). Exceedences of secondary MCL's have not been the basis for regulatory action in the past. Nonetheless, EPA recognizes the potential importance of such measures both in long term ground-water quality and as possible precursors to metals mobility. The issue of observed exceedences of secondary MCL's is discussed further under Topic XIX.D and was taken into consideration for today's rulemaking. No evidence of radionuclides was provided to EPA. (The question concerning the presence of radionuclides is also address in Section XIII F.)

The initial ground-water risk assessment did consider mercury and found that mercury concentrations were below levels of concern.<sup>22</sup> Subsequently, EPA conducted additional analysis of risks from mercury using a more protective (i.e., erring on the side of safety) assumption about the speciation of mercury (i.e., assuming all mercury present was in the more toxic methyl mercury form). No hazard quotients in excess of 1 were found.

Below are the specific constituent-related comments and responses.

1. One of the commenters expressed concern about eight metals for which the commenter believed industry data included only non-detect levels. The commenter was uncertain how (or whether) input concentrations were calculated for these metals.

Response: The commenter's concern about industry data including only values below detection limits for eight metals appears to be based on a misinterpretation of docket materials. In a memorandum regarding EPA's validation sampling in conjunction with industry sampling efforts

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<sup>22</sup> see FF2P-S0363 for documentation of these results.

at three sites,<sup>23</sup> it was observed that approximately eight metals per sample were reported below detection limits in the industry data. This observation applies only for the three sites discussed in the memorandum and the specific metals found below detection limits varied from sample to sample. Therefore, for most metals, EPA was able to calculate input values from a distribution of samples that included both detected and non-detect values. Furthermore, EPA incorporated the non-detected values in the calculation by substituting  $\frac{1}{2}$  the reported detection limit. The only exceptions were antimony, beryllium, and silver in comanaged wastes. Antimony and silver were not present above detection limits in any comanaged waste pore water sample and beryllium was present above detection limits in only one of 11 samples. Given the low frequency of detection for these three metals in comanaged waste, EPA does not believe they are present at levels of concern and did not include them in the risk assessment modeling. EPA acknowledges some concern with the comparative results of different labs and if groundwater modeling is re-visited will address this.

2. One commenter was concerned that EPA did not evaluate certain metals for which adsorption isotherms were unavailable in the ground-water model.

EPA acknowledges that there are several constituents (boron, fluoride, manganese, molybdenum, nitrate, nitrite, and strontium) detected in FFC wastes for which the ground-water model does not include adsorption isotherms. Based on the Agency's screening analysis, however, none of these constituents exceeded HBLs for OCWs and only manganese and molybdenum exceeded HBLs for FBC wastes. Screening hazard quotients (HQs) for manganese and molybdenum in FBC wastes were 1.51 and 2.80, respectively, meaning only limited dilution and attenuation in the environment would be required to reduce these constituents below levels of concern. Therefore, the Agency does not believe any of these constituents would be of concern for the oil and FBC sectors.

In comanaged coal combustion wastes, the screening analysis showed that all of the unmodeled constituents except strontium would exceed HBLs, with screening HQs ranging from 14.3 to 133. Dilution and attenuation factors calculated for other, modeled constituents in comanaged coal combustion wastes ranged from 1.77 to greater than  $10^{19}$ . Therefore, it is possible, although not certain, that some of the unmodeled constituents could have continued to exceed HBLs in a high-end deterministic scenario for comanaged coal combustion wastes, had modeling been possible. The Agency notes, however, that, even had some of the unmodeled constituents exceeded HBLs after modeling, none of the constituents are among those that make up the toxicity characteristic for hazardous wastes. Nevertheless, EPA is conducting a broad review of the ground-water model. If, in the course of this review, it is determined that development of adsorption isotherms for these constituents is possible, given the state of science, and warranted, the Agency may revisit its conclusions regarding these constituents.

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<sup>23</sup> FF2P-S0092.

3. One commenter pointed to the use of a technology-based action level for lead in the ground-water assessment, while the non-groundwater risk assessment did not evaluate lead because it does not have toxicity benchmarks. Another public interest group commenter was concerned that EPA did not seriously consider risks from lead.

**Response:** EPA's risk assessment considered lead. Because lead does not have human health toxicity benchmarks (i.e., RfC, RfD, CSF), risks or hazard quotients cannot be calculated. However, lead does have the potential for adverse health and developmental effects, especially for children. To estimate the potential for adverse effects from lead, the ground-water risk assessment uses the so-called action level (400 mg/kg) for lead as the best available benchmark for drinking water ingestion. Lead concentrations at receptor wells, using available data and the current ground-water model, were below action levels. Table 3 (which was originally presented as Table 5-18 on page 46 of the non-groundwater risk assessment technical background document<sup>24</sup>) presents the maximum lead soil concentrations that were calculated for each scenario modeled. All lead soil concentrations fall well below 400 mg/kg. The Agency, therefore, concluded that lead levels resulting from the management of FFC wastes are unlikely to cause a significant threat to human health.

**Table 3. Maximum Estimated Lead Concentrations in Soil Per Scenario**

Scenario	Lead Soil Concentration (mg/kg)
Utility Coal-fired Comanaged Waste Onsite Landfill	7.63
Utility Coal-fired Comanaged Waste Dewatered Surface Impoundment	1.30
Utility Oil-fired Waste Onsite Landfill	0.98
FBC Onsite Landfill	0.81
FBC Used as Soil Amendment	0.009
Non-utility Coal-fired Waste Onsite Landfill	0.21
Non-utility Coal-fired Waste Offsite Landfill	1.33

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<sup>24</sup> FF2P-S0370. Non-groundwater Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2 (FFC2). Draft Final Report. RTI. June 5, 1999.

**XIV. RISK METHODOLOGY IN GENERAL**  
**C. Constituents Considered**  
**Verbatim Commenter Statements**

Despite the conclusion that mercury is “screened out” of the analysis based on TCLP results, the concentrations measured (even when the median values are taken) reveal that nationally, tons of mercury are being mobilized in these waste disposal sites. The lack of consideration given to mercury releases runs counter to the Administrator’s PBT strategy. (ALA00036)

There is inconsistency between the dose-response assessment used in the groundwater and non-groundwater risk assessment. For example, the hazard benchmark level for lead in groundwater is a technology-based action level. The peer review comments by Dr. James Butler (1998) noted that “a technology-based interim standard is not the most appropriate value to use as a benchmark value (especially for evaluating risks to children)” In the non-groundwater risk assessment, lead was not evaluated “because lead does not have human health toxicity benchmarks risks or hazard quotients cannot be calculated.” (ALA00036)

The risk assessments do not model or even consider the potential for serious damages from constituents in these wastes other than from a select group of metals. Constituents in coal ash that have caused such damage include sulfates, boron, TDS, sodium, chlorides, fluorides and pH. In many cases these constituents have made potable ground waters well offsite virtually unusable. (HEC00056)

The potential for harm from greater amounts of nitrogen compounds in fluidized boiler wastes is not addressed. (HEC00056)

The human health risks of non-groundwater exposure to mercury were not modeled, even though mercury is an acknowledged constituent of co-managed FFC wastes, and a toxic chemical that is a priority pollutant for EPA. (ALA00292)

Furthermore, with regards to the duplicate samples that were analyzed by the Independent laboratory, the EPRI contractor lab had detection limits for 8 metals that were between 25 and 10,000 times higher than the independent lab. (This discrepancy cannot be explained, as both labs used identical procedures). The result of this is that the EPRI contractor reported non-detectable concentrations for the eight metals, compared to positive concentrations reported by the independent lab. In the waste characterization, these non-detects were treated as one-half the detection limit, however in cases where most of the samples did not have detectable levels, no statistical analyses were performed (i.e.. mean median and various percentiles). If the statistical analyses were not available then it is unclear whether these constituents were included in the risk assessments or whether they were dropped. If these constituents were included, it is unclear what

the input values would be because the 50th and 95th percentile values were not calculated.  
(ALA00292)

In addition to uncertainties associated with quantifying the concentration of inorganic FFC waste constituents discussed above, EPA eliminated the organic and radioactive constituents in FFC waste from the risk assessment without any justification. This is despite the fact that these potentially toxic organic constituents, including dioxins and furans, were detected in the samples from site investigations, as reported in the Background Technical Support Document on Waste Characterization (page2-13). (ALA00292)

EPA did not evaluate certain metals because of lack of data on adsorption isotherms that describe the tendency of metals to remain bound to particle surfaces. (ALA00292)

Additionally, recent data from University of Tennessee and Wright Patterson Air Force Base's School of Engineering (OH) show that concentrated wastes may increase health concerns outside of the water quality arena, such as radon emissions. Minute traces of K-40, Th-232, U-238, and Rn-222, present naturally in the soil, are concentrated through coal combustion to levels of concern. Studies at Wright-Patterson calculated that the indoor radon concentrations in a structure built near such a CCW site would be 11.48 pCi/l, well above the EPA's action level of 4.0 pCi/l. In Indiana, where disposal sites need not be located and recorded, this opens the possibility of health issues not related to water quality should residential sites be located in abandoned coal fields. Again, additional data exploring all aspects of this issue need to be further examined.  
(PURD00294)

We urge the agency to take this lead threat to the public health just as seriously as you have lead paint in the past. We keep hearing from the industry side about 'sound science.' Where is the soundness in a so-called 'science' that would raise lead action levels by several magnitudes?  
(PEACE00306)



**XIV. RISK METHODOLOGY IN GENERAL**  
**D. Methodology for Considering Child Risks**

One public interest group commenter questioned why specific models (e.g., guidance on the evaluation of lead exposure in children by the Integrated Exposure Uptake Biokinetic (IEUBK) model; the multi-pathway risk assessment (MPRA) model) were not used to assess child risks.

Response: Based on the analysis for lead that is discussed under Topic XIV.C, that showed lead levels well below the appropriate benchmarks, it was decided that assessing child lead exposures with IEUBK was not necessary. Risks to children were explicitly considered by varying all risk parameters in all pathways of special relevance to children. These included ingestion rates, inhalation rates, body weights, exposures times, et al. Where risks to children were found at actionable levels, and where these differed to any significant degree from risks to adults, they are noted in all documents. The MPRA model was not available in time for this regulatory determination action.

**XIV. RISK METHODOLOGY IN GENERAL**  
**D. Methodology for Considering Child Risks**  
**Verbatim Commenter Statements**

Both these assessments overlook guidance established by EPA on the evaluation of lead exposure in children. "The Integrated Exposure Uptake Biokinetic (IEUBK) is a menu-driven, user-friendly model designed to determine exposure from lead in air, water, soil, dust, diet, paint, and other sources. Pharmacokinetic modeling is used to predict blood lead levels in children 6 months to 7 years of age. The four main components of the current IEUBK model are: (1) an exposure model that relates environmental lead concentrations to age-dependent intake of lead into the gastrointestinal tract; (2) an absorption model that relates lead intake into the gastrointestinal tract and lead uptake into the blood; (3) a biokinetic model that relates lead uptake in the blood to the concentrations of lead in several organ and tissue compartments; and (4) a model for uncertainty in exposure and for population variability in absorption and biokinetics. This model is used in conjunction with the Guidance Manual and other supporting documentation by several EPA offices. (ALA00036)

In the EPA's Children's Environmental Health Yearbook (EPA 100-S-98-002, June 1998, page 125), it is stated that "EPA requires that assessments of children's risk include the use of Agency methods for assessing risk specifically to children (e.g., Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Children). No mention or use of this model is made in the Report. Also in the Yearbook (page 126), there is a section on Office of Solid Waste (OSW) Risk Assessments. It reads: "EPA continues to include children when considering risks posed by contaminants. A new multi-pathway risk assessment (MPRA) model evaluates human and ecological risks from the disposal of more than 100 waste constituents (50 evaluated for ecological risk). The MPRA evaluates the movement of contaminants through the air, surface water, groundwater and soil and the chemical changes that occur during this movement. Because of their small body weight and lifestyle, children may be more likely to encounter higher exposures per unit body weight than adults. In addition, children are more sensitive to certain toxics such as lead and mercury." Given that OSW prepared the FFC report, why is no mention or use of this model in the risk assessment? (ALA00036)

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **E. Selection of Benchmarks (HBL versus MCL)**

Industry commenters and a single public interest group commenter believed EPA should use MCLs as benchmark values for the risk assessment and calculate HBLs only when MCLs are not available. The industry commenters also disagreed specifically with using the HBL for arsenic because it is below detection limits or below background levels of arsenic. The public interest group commenter also stated that the HBLs were based on inappropriate toxicity values.

Response: EPA agrees that MCLs should be one of the values to be considered in its risk assessment, and for this reason compared arsenic levels against the current MCL and a range of potential MCLs. (See Topic XIV.F following.) However, in the RCRA program EPA uses HBLs as the primary consideration in its risk assessments because HBLs represent health effects of the contaminant using the most current toxicity and exposure assumption information available. Also, HBLs are not influenced by technical and economic factors. Thus EPA used both MCLs and HBLs.

The arsenic MCL, as is noted in XIV.F below, is now under careful review in the scientific community. EPA's comparison of leachate, sampling and receptor well concentrations to arsenic MCLs was begun on the October groundwater 1998 report, and subsequent comparisons found that arsenic concentrations have the potential to exceed various plausible arsenic MCLs (as well as the HBL) for comanaged impoundments and landfills, and FBC management units.

Thus, EPA recognizes and took account of the possibility that the arsenic MCL, now under review, is likely to change when EPA's Office of Water publishes a revised MCL (now due under court order by January 1, 2001.)

EPA does not dispute the commenter's assertion that the resulting HBL for arsenic may be within the range of background concentrations (at certain sites) or below detection limits. EPA's modeling, however, is based on incremental risk, above background, and the modeled source terms were based on reported concentrations of arsenic.

**XIV. RISK METHODOLOGY IN GENERAL**  
**E. Selection of Benchmarks (HBL versus MCL)**  
**Verbatim Commenter Statements**

The derivation of a health-based number for arsenic was unnecessary given that EPA has already established 0.05 mg/L. as the drinking water standard. (PG&E00023)

The absence of toxicological profiles for health-based criteria used to estimate risks of FFC waste prevents any opportunity to comment on this critical risk assessment component. Briefly, it is apparent that the hazard benchmark levels used in the Report were based on average exposure parameters and inappropriate toxicity values. (ALA00036)

EPA inappropriately calculated HBLs where MCLs are available. EPA unnecessarily calculated a benchmark value for arsenic (0.00029 mg/L) that is two orders of magnitude lower than the MCL value (0.05 mg/L). Furthermore, the benchmark value is not detectable. In contrast, the benchmark values derived for the other metals are larger than the MCL. EPA should use MCLs for all constituents where MCLs are available and use calculated HBLs only when MCLs are not available. (USWAG00037)

HBNs are not protective of public health ... As discussed in the initial comments made to the docket, EPA did not provide toxicological profiles to evaluate the dose-response values used to calculate the hazard benchmark numbers (HBNs). The most serious concern regarding the dose-response assessment conducted in the groundwater risk assessment is the considerable differences between the Hazard Benchmark Numbers (HBNs) and maximum contaminant levels or MCLs ... The MCLs listed in Table 5 are primary legally enforceable standards that apply to drinking water systems. Primary standards are intended to protect drinking water quality by limiting the levels of a specific contaminant that can adversely affect public health. Since state regulations can be no less stringent than the federal MCLs, action would be taken to address the potential public health hazards from FFC waste contamination in drinking water at much lower levels than HBNs suggest. Furthermore, comparisons of peak concentrations of selected FFC waste constituents that were provided in the June 25th memo from SAIC are presented in Table 6. These comparison indicate that the 95th percentile concentration - which we believe are likely underestimated - exceed primary MCLs, and, therefore, constitute potential public health risks. (ALA00292)

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **F. Arsenic Toxicity**

Several industry and academic commenters suggested that EPA used an inappropriate cancer slope factor (CSF) for arsenic (based on a study that overpredicts cancer risk for U.S. populations) and/or misapplied this CSF in its risk assessment, particularly for child risks, resulting in an overestimate of risk. According to some of these commenters, the resulting arsenic RfD should have been 0.0008 mg/kg/day rather than 0.0003 mg/kg/day. Other industry commenters stated that we evolved as a species in an environment that contains arsenic and, therefore, small incremental exposure are extremely difficult to monitor and the risks associated with that exposure become even more problematic to assign and evaluate. A public interest group commenter, however, stated that if EPA were to apply the reanalysis of epidemiological data regarding the carcinogenicity of arsenic by the National Research Council, the potency of arsenic may increase by ten times. This commenter further stated that analysis underway at EPA's Office of Water suggests the arsenic CSF is likely to be revised downwards in the future, increasing arsenic's estimated toxicity.

Response: EPA recognizes that the CSF for arsenic has been debated for several years and acknowledges the uncertainties associated with the risk assessment. The recent National Research Council (NRC) study ("Arsenic in Drinking Water", National Research Council, National Academy Press, 1999) suggesting a lower drinking water MCL has heightened our concern with regard to the potential presence of arsenic. EPA's Office of Water (OW) is now considering reducing the MCL as recommended by the NRC study, and is charged with finalizing an MCL for arsenic by January 1, 2001. It was because of this uncertainty that EPA compared contaminant concentrations to a postulated range of possible MCLs, as well as the HBL, in its risk characterization.

The ongoing debate as to the appropriate drinking water MCL is part of a much larger arsenic debate involving possible cancer types (including skin, bladder and lung) and incidence as a function of genetics, sex, nutrition and other factors. Bioavailability as a function of arsenic speciation and associated mobility is another complicating factor, especially where, as in this FFC analysis, no speciation data were available. Another factor making any arsenic risk characterization difficult is continuing uncertainty concerning low dose extrapolation. The NRC study concluded that the dose-response curve might exhibit sublinear characteristics in the low dose region, but went on to qualify this by stating that there was no assurance that a departure from linearity was yet justified. Justification for reducing the MCL is thus based on weight of evidence as set forth in the NRC report rather than on resolution of low dose response issues.

The current CSF, contained in EPA's IRIS data base, was based on skin cancer effects alone and did not other cancers now considered to pose potential risk. A revised risk characterization will be conducted to support any new CSF. Until the arsenic risk characterization is updated, the current CSF in IRIS remains as the recommended value. While the implication of

the NRC study is that a new CSF is justified, the NRC study did not make a specific recommendation in this regard.

For non-carcinogenic effects, IRIS lists an RfD of 0.0003 mg/kg/day for inorganic arsenic. IRIS notes that valid arguments can be made that would increase or decrease the RfD by a factor of perhaps 2 or 3, resulting in a possible range of 0.0001 to 0.0008 mg/kg/day. Using an RfD of 0.0008 mg/kg/day instead of 0.0003 mg/kg/day, however, would have little effect on the outcome of the risk assessment. In addition, RfD methodology is considered to embody values with uncertainty spanning at least an order of magnitude. Furthermore, risk estimates identified for arsenic were based on cancer effects, which is independent of the RfD. (It is not correct, as stated in several of the comments, that the CSF is used to derive the RfD.

See Section VIII for additional discussion of this issue.

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **F. Arsenic Toxicity**

##### **Verbatim Commenter Statements**

There seems to be some concern with regard to the actual assumptions that went into assigning the toxicity to arsenic that clearly needs to be evaluated. Arsenic fails in all cases because of the larger risk that EPA has associated with it. For example, the biota in which we have evolved in has developed in a sea of radioactivity. We are what and who we are because of the environment, including the radioactive background. If small incremental increases to radioactive exposures occur, our ability to quantify the impact of this event is very limited. Modeling exposure consequences for high dose events and extrapolating through these events is straightforward. However, extrapolating to the background exposure becomes very tricky. Our exposure to arsenic follows exactly the same scenario. We evolved as a species in an environment that contains arsenic (see Appendices II and III). Small incremental exposures are extremely difficult to monitor and the risks associated with that exposure become even more problematic to assign and evaluate. (ARIPPA00019)

EPA's approach in establishing a health-based number of 0.00029 mg/l, a value which is greater than 200 times less than EPA's current standard, was overly conservative based upon current human health population statistics, published background conditions throughout the United States and toxicity factors critiqued by EPA. Health-based numbers were calculated using toxicological information, ingestion rate, frequency, duration, and receptor body weight based on current acceptable population statistics. EPA's assumption that human health population statistics will not evolve at all over the next 400 years is highly speculative. Changes in human diet, living conditions, and medical advances alone in the past 400 years demonstrate how speculative this assumption is. The literature background concentrations for arsenic in natural groundwater range from 0.001 to 0.03 mg/l (Dragun, 1988). Background concentrations of arsenic in the absence of any fossil fuel combustion waste are typically 3.4 to 100 times greater than the health-based number used by EPA in the Report (0.00029 mg/l). Again, this results in overly conservative assumptions and conclusions that are not based on real-world conditions. The toxicity factors used to calculate a health-based number for Arsenic are based on the prevalence of normally non-fatal skin cancer observed in a Taiwan epidemiological study conducted by Tseng et al. This study has been peer reviewed and has been shown to have study limitations that likely over predict actual cancer risks for US populations. The results of this study likely over predict actual cancer risks for U.S. populations. That this modeling seriously overstates the potential risks to human health or to the environment is supported by the fact that EPA has not found documentation of actual harm or significant releases of toxins such as arsenic despite considerable experience and monitoring of these practices. (PG&E00023)

As discussed previously (Section C-.2) the toxicity factors used to calculate a Heath-based number for arsenic are inappropriate and have been questioned by EPA and other health scientists. The

toxicity factors are based on the prevalence of normally non-fatal skin cancer observed in a Taiwan epidemiological study conducted by Tseng et al. This study has been peer reviewed and has been shown to have study limitations that likely over predict actual cancer risks for US populations. (PG&E00023)

The risk assessment should not have utilized data from the Taiwan arsenic epidemiological studies, since those studies have major flaws that “invalidate the use of these data for most exposed individuals in the US”. (NMA00024)

Arsenic is consistently identified in each of the waste management scenarios at levels of public health concern. If we were to apply the recent reanalysis of epidemiological data regarding the carcinogenicity of arsenic by the National Research Council, the potency of arsenic may increase by ten times. This would increase the highest risks reported for arsenic from groundwater contamination by coal waste from one in one-hundred to one in ten. (ALA00036)

The cancer slope factor used to derive the reference dose (RfD) of 0.0003 mg/kg/day used in the non-groundwater risk assessment is based upon a fundamentally flawed epidemiological study. In the 40 C.F.R. Part 503 Subpart B biosolids rulemaking, EPA used a reasonable RfD value of 0.0008 mg/kg/day. If the biosolids risk assessment had used an RfD value of 0.0002 mg/kg/day, it would return an acceptable limit for As of only 1 ppm. To put the absurdity of that result in context, note that the U.S. Geological Survey has reported a nationwide mean soil background As concentration of 5.2 ppm with a standard deviation of 2.23 ppm. (USWAG00037)

Testimony presented by Dr. Chaney or the USDA at the EPA Public Hearing on May 21, 1999, highlighted serious flaws in the determination of the arsenic cancer slope factor used for justifying the arsenic reference dose of 0.0003 mg/kg/day. In this RTC health risk analysis, results indicate that potential health risks from children ingesting soil with a arsenic concentration of 1 ppm. If this is indeed the case, we need to enact national regulations against any child eating any native soil, as the USGS has determined that the average soil in the United States contains over 5 times the “safe” concentration of arsenic! (Refer to USGS Professional Paper 1270.) Previous EPA health risk analyses, notably for land application of sewage sludge (40 CFR 503(b) Rules), used an arsenic reference dose of 0.0008 mg/kg/day, resulting in a more realistic “safe” arsenic concentration of 41 ppm. (NSP00057)

Cancer Slope Factor (CSF): EPA determines this value from reviews of the available toxicological literature; prior to about 1997 an oral dose of 0.0008 mg/kg-d As was considered acceptable, but this was subsequently reduced to 0.0003 mg/kg-d. EPA acknowledges considerable uncertainty in this value (see comments in IRIS database, U.S. EPA), and states that this uncertainty gives environmental managers “considerable flexibility” in assessing risk for a given scenario. The CSF factor of 1.5 is based on limited data, and is likely to be on the



conservative side. However, given the lack of further information it is difficult to treat this value as an “adjustable” parameter in the risk assessment. (PHS018)

Errors in Taiwan epidemiological study prevent its use in risk assessment. During consideration of changes in the As limit for drinking water, EPA was informed that the major Taiwan epidemiological study by Tseng et al. was seriously flawed during data collection. Individuals in the same village had high As and very low As well water, and drank the water from their own well during their life. Nevertheless, it has been found that the median well As concentration was used to classify the village As exposure when assessing cancer outcomes many decades later. Further, errors were found in the method of analysis of As in water at lower concentrations. Together these errors cannot be corrected since the low response of persons with low exposure cannot be separated reliably from the overall data. EPA should not be using the cancer slope factor based on that work in development of risk assessments, regulations, or Reports to Congress, nor a RfD which is based on this cancer slope factor. (PHS011)

Water consumption by the exposed Taiwanese population is greater than the 2 L/day assumed by EPA in risk assessment, which increased the cancer slope factor inappropriately. During the drinking water As risk assessment, the volume of water required by persons working outdoors in sunny rice fields in the summer in Taiwan became a subject of debate. With recent experience within DOD of water requirements of persons in such hot climates, EPA was advised to shift to 8 L water per day rather than 2 L/day assumed in US risk assessments. This change would reduce the cancer slope factor by about 4-fold. (PHS011)

Inorganic As in rice contributed significantly to As exposure in the Taiwanese exposed population, which increased the cancer slope factor inappropriately. Research by Schoof et al. (1998) and Yost et al. (1998) identified a separate error in the As dose estimation for the Taiwan population. It had been assumed by EPA's Office of Drinking Water that most As in plants was organic. Measurement of the species of As in rice and dried yams, principle foods of the exposed farm populations in Taiwan, showed these foods to contain largely inorganic As. This As would have added to the inorganic As dose; with constant measured response, the cancer slope factor would have been found to be lower. (PHS011)

Research has shown that the extent of harm to the Taiwanese and other As-harmed populations was partially related to poor nutrition of this population during their exposure. Although there is no clear way to deal with the effect of malnutrition in risk assessment for US populations other than consideration of “High-End” exposures, evidence from many locations where humans have suffered skin disease from excessive long-term consumption of As-rich drinking water has indicated that persons with the same water, but better diets, did not suffer evident skin lesions. Some evidence suggested the main difference might be the intake of meats with more methyl-donor amino acids, etc., which might have increased the rate of As detoxification by persons with improved nutritional status. Because exposed US populations are not so severely malnourished as the subsistence rice consuming populations in Asia, it may be appropriate to reconsider the dose-

response relationship estimated for the Asian populations. When safety factors are hidden in risk assessment, unnecessary concerns are raised. (PHS011)

PG&E Gen's review identified numerous problems that cause the model to overestimate the potential risk presented by this beneficial use of coal ash, such as ... use of unrealistic toxicity factors from a highly criticized health risk study. (PG&E00274)

There were several comments regarding the cancer slope factor for arsenic and arsenic bioavailability provided to EPA during the public review period. We believe that the comments do not reflect the wealth of information the Agency is currently considering regarding the health effects of arsenic. First, the cancer slope factor for arsenic is likely to be revised downward. EPA should be aware of the considerable effort currently underway in the Office of Water to comply with the 1996 Safe Drinking Water Act provision that requires EPA to establish a MCL for arsenic by January 1, 2000. This effort has included the establishment of a Subcommittee on Arsenic of the Committee of Toxicology of the National Research Council (NRC) and an Expert Panel on Arsenic Carcinogenicity under the Integrated Risk Information System (NRC, 1999, EPA, 1999). The findings of these efforts reflect the state-of-the science by the leading experts on the health effects of arsenic. In addition, there is an extensive research program that has been established under the 1996 Strategic Plan for the Office of Research and Development to involve Agency-wide research activities to contribute to the development of an arsenic drinking water regulation. It is beyond the scope of these comments to provide a summary of these substantive activities currently underway at the Agency. However, it is imperative that EPA actively engage the Office of Water in the FFC waste regulation to respond to public comments that suggests that the slope factor overestimates cancer risk, because this viewpoint is not supported by the current analysis underway at your Agency. EPA should consider the information in the risk characterization of FFC waste. (ALA00292)

The Subcommittee on Arsenic of the Committee of Toxicology of the National Research Council published a final report in March 1999, which concluded that recent studies suggest that drinking water with high levels of arsenic can lead to bladder, and lung cancer, which can be more fatal than skin cancer. The Subcommittee examined seven International epidemiological studies, including research from Taiwan, Argentina, and Chile. All these studies show that in addition to causing skin, bladder, and lung cancer - exposure to arsenic in drinking water can cause skin lesions, anemia, nerve damage and circulatory problems. Finally, and most importantly with regard to the groundwater risk assessment of FFC waste, the report concluded that "the epidemiological findings, experimental data on the mode of action of arsenic, and available information on the variations in human susceptibility, it is the Subcommittee's consensus that the current EPA MCL in drinking water of 50 ug/L does not achieve EPA's goal for public-health protection and, therefore, requires downward revision as promptly as possible." Based on the incidence of bladder cancer from Taiwan studies, that are qualitatively confirmed by data from Chile and Argentina the NRC determined that the difference in the potency at the modeled point of departure (POD) is around 10-fold less than the current cancer slope factor. There are

uncertainties in this extrapolation. Extrapolations below 100 ppb become nonlinear and should be caveated as probable overestimates and both the POD and the environmental exposure (real or projected) should be examined as the NRC did. Based on this analysis by the NRC, the suggestion that arsenic is less toxic than and the state-of-the-science regarding the health effects of arsenic should be incorporated into the Report to Congress. (ALA00292)

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **G. Site Averaging**

Industry commenters suggested that site averaging overestimated risk. One of the commenters stated that using a numerical average to represent a typical value for concentrations that are likely characterized by a lognormal distribution would be an overestimate. A geometric mean would have been a more appropriate representation of a typical value for a given site. Another of the commenters stated that EPA should have used the all the data as independent observations and fitted the best probability density function, rather than use the 95<sup>th</sup> percentile site-averaged concentrations. According to the commenter, under this approach, the 95<sup>th</sup> percentile porewater concentration for arsenic would have been less than 0.5 mg/L, rather than 9.64 mg/L. The commenter also suggested that EPA overlooked the variations within each waste management unit and inappropriately assumed the release of uniform concentrations across the unit.

Public interest group commenters, on the other hand, argued that site averaging underestimated risk by cutting off extreme observations. These extremes reflect “hot spots” of non-uniform mixing that should be modeled. One of these commenters further stated that variation within facilities is at least as important as variation between facilities. Another of these commenters stated that EPA should have used the 95<sup>th</sup> percentile upper confidence limit of the arithmetic mean of a lognormal distribution. This commenter also specifically addressed the site averaging approach for OCW (oil combustion wastes), which changed between the draft risk assessment and the sensitivity analysis, and requested an explanation of why the revised approach would not underestimate high-end concentrations.

Response: EPA believes its approach to site averaging was both reasonable and appropriate as a method of producing a typical, yet conservative input value for use in the risk assessment. The approach allowed characterization of the variations between sites without overweighting sites with more characterization data and without overweighting unusually high or low values that would not be typical of entire management units. EPA believes use of this approach produced an appropriate estimate of upper-bound and probabilistic risk for purposes of this study without unnecessarily over- or under-estimating risk. EPA checked this approach in each case with the available site data to be sure mischaracterization would be minimized, if not avoided entirely. EPA used a log normal distribution as suggested by one commenter.

EPA disagrees with the comment that it assumed uniform release of contaminants from a particular comanaged waste management unit. Contaminant supply is finite, and release will vary over time depending on opening and closing of landfill cells, closing of an impoundment and many environmental factors. Variations of measured contaminant within each management unit are reflected in the data. To simplify its analysis, EPA calculated a single contaminant concentration for each site, as noted above, to represent the overall effects of this variability, but this calculation does not imply that contaminant release is uniform.

EPA disagrees that its site averaging approach underestimates risks. The management units in question are large in size and have compositional variations. The management units may contain “hot spots” but may also contain wastes with relatively low contaminant release. While EPA intended its analysis to be conservative, an analysis which focuses on the extremes posed within individual sites would be unrealistic. While EPA has found instances of localized high contaminant concentrations, it has not found instances where an entire management unit has these characteristics and believes such an instance is unrealistic. Therefore EPA disagrees with the commenters that these localized effects were not adequately addressed in the risk assessment. EPA contends that its use of site averaging, with the subsequent selection of the 95<sup>th</sup> percentile concentration, represents a defensible high-end initial concentration. EPA utilized the data collected and provided by industry, in reaching the risk findings noted for coal combustion wastes.

The above issue concerns the best way to characterize a waste management unit, and EPA acknowledges that opinions may vary. At one site, measured concentrations varied from below .01 mg/l to over 80 mg/l. This reflected a very thorough data collection effort; yet no argument can be made that either extreme is representative of the volume of waste in that unit.

EPA also maintains that the site averaging methodology adopted in the sensitivity analysis is appropriate for OCWs. EPA has found that oil combustion facilities operating surface impoundments commonly manage their fly ash along with low-volume wastes in a single impoundment or series of impoundments. The dredged solids are subsequently landfilled offsite. The bottom ash is typically managed separately from the fly ash but also landfilled offsite. Therefore, all of these wastes are eventually landfilled, and it would be plausible for a generating facility to use a single landfill location for the disposal of its different wastes. In conclusion, because facilities may combine different types of oil combustion wastes in a single management unit, EPA believes that its calculations are appropriate and do not underestimate potential risks for the landfill scenario.

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **G. Site Averaging**

##### **Verbatim Commenter Statements**

The TCLP input data used for EPA's groundwater modeling represent "facility-averaged" values, and thus do not represent actual high-end values. EPA rationalized the use of average values because "the Agency was more interested in variation between facilities than variation within facilities." This rationale is both misguided and fails to support the intended objective anyway. The Report to Congress and the associated regulatory determination are supposed to ascertain whether FFCW wastes warrant regulation. Thus for this purpose, variation at individual facilities is at least as important to capture as the variation between facilities. Moreover, high and low values at individual facilities are actually better indications of the full extent of variations on a national basis when aggregated. Perhaps more importantly, the measured high-end values at individual facilities represent real-world "hot spots" reflective of non-uniform mixing of various wastes within very large units. Indeed, it is not unreasonable to expect that contaminants migrating from these units may preferentially reflect areas where one or more low-volume wastes have been placed, subsequently enhancing the migratory potential of other wastes coming into contact with them. Therefore, unless EPA can demonstrate uniform mixing and/or only "average" waste contamination migration at these facilities, the "potential" risks from the co-management units in the Report to Congress are equally or more accurately reflected by releases from "hot spot" areas. (EDF00021)

EPA also cannot vouch for the representativeness of the TCLP data on a facility-specific basis, therefore the Agency hasn't a clue what it is combining to achieve a so-called "average" result. The term itself is misleading in this regard. Averaging non-representative data for a facility does not magically yield a representative facility average. For all these reasons, EPA's objective of capturing variations between facilities using facility-averaged data is extremely problematic based upon the data now available, and in fact national variation would be better captured by incorporating true high-end values measured at particular facilities. As a consequence of relying upon facility-averaged data instead of actual high-end measured values, the "screening analyses" relied upon by EPA to exclude most hazardous constituents that "might" be a threat were far from the conservative analyses EPA describes in the Report to Congress. For these assessments, EPA claimed to use the 95th percentile waste concentrations, but by using the 95th percentile of the facility average data, the Agency failed to utilize actual high-end values measured consistent with risk assessments performed in support of listing determinations and other RCRA proceedings. The same is true of EPA's subsequent monte carlo analyses, because none of the 2,000 model runs reflect actually measured high-end values. (EDF00021)

Some of the documents I have examined indicate that the sample giving the 9.64 ppm arsenic value from the deterministic case came from a site in Missouri where pore water sample were taken up and down the length of the core from above the water table and that the concentrations were

attenuating rapidly downward through the sample before the water table was reached. If this is true then the use of this sample in the deterministic case was a technical catastrophe. Not only was the wrong kind of sample used and averaged as if it represented an intercept with the water table down the entire length, but the sample showed that attenuation far beyond the value used had occurred before contact with the water table ... Using a simple averaging process to reduce data from many levels in several cores to a single value for a site was a statistical blunder. The fact that the procedure was allowed to mask data in direct conflict with the way the model was run is exceptionally hurtful to good science has resulted in claiming a water table contact concentration that was nearly two orders of magnitude off from what the data actually showed. (NMA00024A)

EPA first averaged pore water concentrations numerically up and down the entire length of the cores sampled. The problem with taking numerical averages of samples from a lognormal distribution (trace element distributions are almost always lognormal and conversations with the EPA's contractor on the modeling indicated that they had confirmed lognormality of the data – another fact not apparently in the report) is that values from the upper X% of tail are much further from the value of the bulk of the samples than the corresponding X% value from the lower tail. Although mathematicians give a little more hairy an explanation of what is happening the result is that the numerical average value will (except by pure luck) always drastically over-estimate the typical value for the population. Taking numerical averages also distorts the shape of the distribution of averages relative to the original population. Those familiar with statistics usually know that the most basic theorem is the “Central Limit Theorem” which says that the distribution of average values will tend to be a normal distribution regardless of what the original underlying distribution was (ie., EPA's action of creating secondary populations by taking numerical averages was already reducing skewness and distorting the data toward a normal distribution). EPA then took all the already once averaged pore water concentrations from samples over entire sites and took another numerical average pore water concentration for the site ... Remember, however, that the typical values of this population have already been shifted upwards through the use of numerical averages instead of geometric means and that the skewness of the distribution has been reduced shifting more weight into the upper tails. (NMA00024A)

The high-end deterministic assessment was designed to provide an estimate of exposure (and risk) that is greater than or equal to the risk expected at any site. To establish this, EPA determined the 50th and 95th percentile concentrations by averaging all the samples from a given site to arrive at a single leachate concentration. These average values were then arrayed to develop the 50th and 95th percentile for each constituent in each waste type. In other words, the 50th and 95th percentile concentrations were generated from facility-wide averages and do not necessarily reflect high-end estimates. (ALA00036)

EPA changed the concentration data for individual wastes for the oil ash scenarios. The facility average 95<sup>th</sup> percentile concentration that was calculated for each waste type was revised to include all wastes. Since there are significant differences in the concentration of chemicals in the various waste types, EPA needs to provide an explanation. as to why this approach would not

underestimate the high-end concentrations by combining waste that have relatively high levels with wastes that have relatively low levels of contamination. (ALA00036)

For inputs to the deterministic model for each waste management scenario and each constituent of concern, EPA calculated the average value of all porewater data for each waste management scenario and each constituent of concern for each given site. EPA then chose the conservative 95th percentile concentration as the "high end" value for model input. Where there were data available from fewer than 20 sites, EPA used the highest available value as the input concentration. This approach accentuated and magnified anomalous data points. (USWAG00037)

As discussed above, a more representative selection of high-end values would have provided a more accurate assessment. EPRI provided over 100 porewater concentration data points taken from over 15 landfills and impoundments. Rather than the 95th percentile site-averaged concentration, EPA should have used these data as independent observations and treated them as random values for statistical purposes. This approach would have provided the best definition of porewater concentration probability distribution. The Agency should then have fitted the best probability density function to the data to obtain an estimate of the central tendency as well as the high end value. An examination of the arsenic data, for example, indicates that the 95<sup>th</sup> percentile concentration should have been less than 0.5 mg/L, compared to the value 9.64mg/L used in the risk assessment. Thus, EPA used an input concentration value almost 20 times too high. (USWAG00037)

The waste characterization data were averaged for each facility and then the averages were averaged -- which completely masks any high values, and is inconsistent with a conservative approach. (49CAO00058)

The exposure and risk assessments seemingly do not represent a "high-end" analysis, but rather represent averaged data. (49CA00058).

Demonstrating that the upper bound concentrations of FFC waste constituents have been evaluated in the Report to Congress is central to EPA's contention that the risks have been overstated and, therefore, should be dismissed. EPA calculated facility-wide averages for 14 sites. These averages were then arrayed and the 95th percentile was determined. Because facility-wide averages were used, the 95 percentile values represents the 95th percentile of the average FFC waste concentrations and not of the 95th percentile of the distribution. This concept is illustrated in Figure 1. According to EPA policy these statistical values are considered central tendency and not high-end values. Figure 1 also illustrates that as the sample size increases the UCL of the mean moves closer to the true mean, while the 95th percentile of the distribution remains at the upper end of the distribution (EPA, 1992). (ALA00292)

The waste characterization data presented in the Report to Congress shows that FFC waste is highly variable. SAIC observed that the concentration of some metals in waste leachates was



found to vary by up to three or four orders of magnitude (SAIC, 1998, page 2-1). To address the uncertainties associated with estimating the true average concentration that results from variability of environmental contaminants, the Agency has established the use of the 95th percent upper confidence limit (UCL) of the arithmetic mean in exposure assessments (USEPA, 1992). It does not appear that the facility-wide averages calculated from the 14 site investigations is the most appropriate statistical approach to address the limited sampling data and variability in the FFC waste constituents. However, we are unable to calculate the 95 percent UCL of the average for FFC wastes and compare it to the values used in the Report to Congress because, as previously mentioned, the analytical data are not provided in the Report to Congress or technical background documents. The June 25<sup>th</sup> SAIC memo to CATF does indicate that the FFC waste characterization data are log-normally distributed. Therefore, the following equation (Figure 2) should be used to calculate the upper confidence limit of the arithmetic mean for a lognormal distribution. (ALA00292)

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **H. Inclusion of Montour**

An industry commenter indicated that the inclusion of the Montour site skewed the risk results because this site is not representative of actual management practices at the majority of sites. A public interest group commenter was concerned that the Monte Carlo analysis did not incorporate the concentrations from this site and another site with a high-end arsenic concentration.

Response: EPA believes the inclusion of the Montour site was reasonable and appropriate. The highest arsenic pore water concentrations were found at this site, and were subsequently used as input concentrations in the risk assessment. EPA agrees with the commenter that this particular site has unusual management practices and may not represent a “typical” facility. One objective of EPA’s risk assessment was to identify high-end risks. Therefore, the assessment used high-end initial concentrations as source concentrations. High end initial concentrations may be found at a minority of sites, such as Montour. These data were provided, voluntarily, by industry, presumably to be used and not dismissed as typical of an “outlier.” There is no assurance that such data might in fact represent an “outlier”.

EPA simply used the data it had, and described the data used in each case. The data point used was not the highest reported at Montour by a factor of approximately ten; the data point used was the average of the data set provided by industry.

At the same time, EPA appreciates the commenter’s concern that inclusion of this particular site may have given excessive weight to the worst-case observations of arsenic concentration in the relatively small sample size. As part of its revised analyses in October 1998, EPA performed a high-end deterministic analysis removing the Montour site from the distribution of arsenic data. The next highest site-averaged arsenic concentration was approximately half of the value observed at Montour (5.4 mg/L at CASJ site vs 9.6 mg/L at the Montour site). Resulting risk decreased by the same amount (i.e., approximately half).<sup>25</sup> Therefore, this change in input concentration did not result in a statistically significant reduction in risk...e.g. one half of an estimated  $4 \times 10^{-4}$  is  $2 \times 10^{-4}$ .

In response to the public interest group commenter, the Monte Carlo analysis does incorporate the full distribution of calculated input concentrations from all sites, including Montour and the CASJ site (i.e., the site with the second highest site average arsenic concentration).

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<sup>25</sup> FF2P-S0361, Attachment 1 (Deterministic Results).

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **H. Inclusion of Montour**

##### **Verbatim Commenter Statements**

In the case of arsenic, it is clear that a statistical outlier skewed the entire modeling effort and rendered the results unfit for a generic nationwide determination to regulate. Arsenic concentrations in surface impoundment pore water samples ranged from 0.0075 to 9.64 with a mean value of 1.57 mg/L. EPA used the high end value 9.64 mg/L to characterize all electric utility industry co-management surface impoundments. This high-end value was the maximum observed value at the Montour ("MO") site. After a simple review of the full set of available data, it becomes evident that the arsenic concentrations at the MO site are not representative of the arsenic concentrations in waste management units in the industry. For that matter, this value is not representative of arsenic concentrations at this site, as discussed in detail in the next bullet point. Nonetheless, EPA used the MO concentration data to model arsenic risk that is orders of magnitude higher than would be the case if a representative sample were used. (USWAG00037)

EPA's arsenic source term concentration is based upon anomalous management practices at one site. EPA's source term selection process also overlooked the variations occurring within each waste management unit, and the Agency inappropriately assumed the release of uniform concentrations across the unit. The high arsenic concentrations at the MO site were observed only in porewater in the upper portion of the mill rejects area, which contained only mill rejects over an ash base. This dedicated mill rejects area represented less than 7 percent of the total area of the 144 acre impoundment. The assumption that arsenic is being released to groundwater from the entire facility at the porewater concentration in the mill rejects area grossly overestimates the arsenic release to groundwater. Segregated management of mill rejects as was practiced at the MO site is not typical of most utility impoundments. (USWAG00037)

It does also appear that the runs did not include the higher end concentrations reported in two site investigations. (ALA00292)

## **XIV. RISK METHODOLOGY IN GENERAL**

### **I. Adequacy of Coordination**

Public interest group commenters expressed concern that the ground-water and non-groundwater risk assessments were not adequately coordinated. One of the commenters was specifically concerned that the assessments were not conducted in such a way as to allow aggregation of risks. The commenter was also concerned that the assessments used different receptor characteristics.

Response: EPA believes that the ground-water and non-groundwater risk assessments were adequately coordinated. Both assessments used data from the same waste characterization sources and used identical values for waste management unit characteristics. Both assessments were double high-end assessments, used similar screening procedures, presented results in similar format, and were subject to the same degree of peer review. The Agency acknowledges that it did not attempt to aggregate risks from the ground-water and non-groundwater pathways, but does not believe such aggregation is appropriate, given that very different populations would be exposed via these pathways. Exposures to above ground risks from agricultural use are to current populations. Ground-water contamination may take generations or hundreds of years to reach human populations.

The commenter's concern regarding the use of different receptor characteristics centered on the premise that using different receptor characteristics "makes it impossible to aggregate the ground-water and non-groundwater risks into a total human health risk." As mentioned in the preceding paragraph, EPA asserts that it is inappropriate to aggregate risks that are occurring at different time periods. Review of Table 5-23 in Technical Background Document for the Supplemental Report to Congress on Remaining Fossil Fuel Combustion Wastes: Ground-Water Pathway Human Health Risk Assessment<sup>26</sup> shows that the time to reach risk generally requires time periods that are in the thousands of years. However, the time to reach maximum risk for the non-groundwater pathways is achieved during the operating life of the waste management unit which, depending on the waste management scenario, is assumed to be 30 to 40 years. The one possible exception to this involves vanadium in oil combustion wastes managed in an onsite monofill where the time to peak ground-water concentration was 80 years. For this scenario the non-groundwater analysis assumed a monofill life of 30 years and therefore maximum risks would have been achieved within that 30 year period. While the times to maximum risk were much closer for this scenario, EPA still considers the aggregation of ground-water and non-groundwater risks inappropriate, primarily because, as noted in other responses, they occur at times that may be as much as hundreds of years apart.

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<sup>26</sup> FF2P-S0363.

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **I. Adequacy of Coordination**

##### **Verbatim Commenter Statements**

There is inconsistency between the dose-response assessment used in the groundwater and non-groundwater risk assessment. (ALA00036)

Despite the Agency's assurance that every effort was made to coordinate the groundwater pathway analysis and the aboveground exposure assessment, a close reading reveals that the modeling assumptions for each are such that the exposures are evaluated separately. (ALA00036)

While the Agency claims that every effort was made to coordinate the groundwater pathway analysis and the aboveground exposure assessment, it appears that these evaluations were done completely separately. (49CAO00058)

EPA has not included such aggregate human health risk figures in its Report to Congress. It seems that this was not done, in part, because the analyses were not conducted in such a way as to facilitate or allow for it. (ALA00292)

However, as stated in the EPA's own draft Groundwater Pathway Human Health Risk Assessment, the groundwater and non-groundwater analyses are inconsistent with respect to the characteristics of the receptors. This is the inconsistency that makes it impossible to aggregate the groundwater and non-groundwater risks into a total human health risk estimate. (ALA00292)

#### **XIV. RISK METHODOLOGY IN GENERAL**

##### **J. Waste Management Unit Size**

A public interest group commenter stated that no data were available on the area of oil combustion waste surface impoundments and argued that EPA should collect this data. The commenter also argued that EPA consistently underestimated waste management unit sizes.

Response: Data were available on the area of oil combustion waste surface impoundments in the EPRI report on oil combustion waste management.<sup>27</sup> EPA used these data to describe oil combustion impoundment size in the Report to Congress and to calculate input values for the risk assessment. EPA also disagrees that waste management unit sizes were consistently underestimated. For its assessments, EPA used data from surveys sponsored by industry associations to estimate the size and characteristics of the waste management units. These data represented the best available for characterizing these particular waste management units. EPA used the distribution of these values as inputs in its Monte Carlo analyses, including very large units.

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<sup>27</sup> FF2P-S0326.

**XIV. RISK METHODOLOGY IN GENERAL**  
**J. Waste Management Unit Size**  
**Verbatim Commenter Statements**

In the assumptions for developing hypothetical waste management units, EPA desired to use 50th and 95th percentile values for estimating the unit size. However, comparison the area selected in the assessment with data from an industry survey indicates that EPA consistently underestimated the size of the units in the assessment compared to actual field data. (ALA00036)

It is difficult to assess the parameters chosen for WMU area as only summary data are provided in the docket, from the EPRI survey of waste management practices. Even the technical background document fails to provide any detailed information. Based on the summary statistics provided, the WMU area chosen for the CCW and FBC landfills seem reasonable. In contrast, no data are available regarding the area of oil waste impoundments. As a result, only one oil waste unit was modeled, with dimensions calculated from an estimate of oil waste generation. The Agency should request impoundment area information from the oil waste facilities that participated in the EPRI survey. This information should be readily available and is critical to evaluating wind erosion from surface impoundments. (ALA00292)

## **XV. GROUNDWATER RISK MODELING**

Many commenters provided input on the design of EPACMTP, the groundwater model used in the analysis. One of the commenters stated that even the selection and use of EPACMTP was inappropriate. These and other commenters questioned one or more of the specific assumptions or input values used in its application. Specific concerns are addressed below in this section following this general response.

Response: EPA is carefully reviewing all of the comments on the model. The process of thoroughly investigating all of the comments will take substantially more time to complete than is available within the court deadline for issuing this regulatory determination. Accordingly, we are not relying on the results of our ground water pathway risk analysis in support of today's regulatory determination on fossil fuel combustion wastes. As explained elsewhere, in making today's regulatory determination we have relied on other information related to the potential danger that may result from the management of fossil fuel combustion wastes.

Meanwhile, we will continue with our analysis of comments on the groundwater model and risk analysis. At this time, we have not determined which, if any, changes are appropriate to make to the model. If our investigations reveal that a re-analysis of groundwater risks is appropriate, we will re-evaluate today's decisions as warranted.

In addition to our ongoing review of comments on the groundwater model, one element of the model – the metals partitioning component called "MINTEQ" – has been proposed for review by EPA's Science Advisory Board (SAB). When such additional review is completed, we will take this into account in any overall decision to re-evaluate today's regulatory determination.

Aside from model design issues, EPA believes the assumptions and input values it used in this application of EPACMTP were appropriate, given the specific characteristics of FFC wastes and the environmental settings of FFC facilities. The concerns raised by the commenters with regard to individual FFC waste-specific EPACMTP inputs and assumptions are addressed in the responses below.



## **XV. GROUNDWATER RISK MODELING**

### **Verbatim Commenter Statements**

The workhorse model that the EPA has adopted for deterministic risk assessment does not appear to be robust enough to adequately address the many and varied conditions that are encountered with the management practices of FBC ashes. It was developed as a “generalized” model to fit national needs. (ARIPPA00019)

The extreme conservatism has resulted in the application of unreliable, mutually exclusive data that, on occasion, results in scenario parameters that break basic scientific principals. Selecting the input parameters more carefully in order to more realistically represent even extreme conditions for managed FBC ashes should dramatically change the outcome of the Report and position of the EPA on FBC ash. (ARIPPA00019)

The human health risk assessment used a hypothetical groundwater exposure that is overly conservative. The EPA should have used more realistic exposure point concentrations within a realistic time frame. In PG&E Gen’s view, the selection of the EPACMTP fate and transport model, input parameters to that model ... are overly conservative, as discussed below. (PG&E00023)

The selection and use of EPACMTP to model the fate and transport of metals in the environment is inappropriate. The model oversimplifies what happens to metals in the environment and fails to consider likely documented reactions (see comments below). EPA, in fact, recommends the use of other models (such as MINTEQA2, GEOCHEM) for predicting metals fate and transport (McLean and Bledsoe, 1992). (PG&E00023)

Dr. Paul of Southern Illinois University also noted some fundamental flaws in the EPA computer model used to construct a risk assessment on the groundwater pathway. Dr. Paul highlighted some of those concerns-in his May 21 testimony, and his final written comments provide considerably greater detail. (NMA00024)

It is my belief that the real world could not validate even the isolated harms identified in the computer models because the models were fed extreme inputs and because the model does not treat important natural attenuation processes. (NMA00024A)

To summarize, the pertinent part of EPA's groundwater modeling methodology was not reviewed by SAB, and the modeling methodology suffers from substantial flaws as identified in the enclosed report (which in some cases were previously acknowledged by EPA in other contexts but never properly revised for this effort). These flaws produce substantial understatements of potential groundwater risks, and consequently explain (at least in large part) why EPA's metals modeling is inconsistent with EPA damage case information in a variety of RCRA contexts. (EDF00021)

The inadequacies of the risk assessment suggest that the depiction of risks is incorrect in the risk characterization portion of the analysis. (ALA00036)

By using extremely conservative assumptions in the model that fail to mimic real world conditions, the model produces exaggerated risk conclusions divorced from reality and ceases to be a tool for sound regulatory decision-making. (USWAG00037)

As discussed in detail below, the chosen model, Composite Model for Leachate Migration with Transformation Product ("CMTP"), has been applied to conditions beyond its capabilities, and extremely conservative assumptions have compounded the error. (USWAG00037)

Not only did EPA neglect the wealth of real world data in favor of a model that is ill-equipped to simulate the conditions occurring in FFC waste landfills and surface impoundments, but the Agency modeled conditions that are too far removed from reality to form a defensible foundation for regulatory action. (USWAG00037)

However, with the decision to use a predictive model as a policymaking tool comes the obligation to base the selection of input parameters on sound science. The assumptions that form the basis of the Bevill modeling effort run afoul of that duty and undermine their national applicability. As one of the two peer reviewers of the non-groundwater risk analysis stated, "The scenarios addressed by the document cannot be applied on a nationwide basis." (USWAG00037)

USWAG comments provide detailed, technical information demonstrating the risks are overstated by several orders of magnitude. Reiteration of the technical arguments is unnecessary. However, APS strongly agrees with USWAG's position that ... the modeling incorporated numerous overly conservative and technically inappropriate assumptions including the questionable application of pore water data ... Cumulatively, the numerous technical issues associated with the model invalidate the agency's concern with respect to the groundwater risk associated with arsenic. (APSC00043)

Because of their limitations, environmental models (including risk assessment models) quite often substantially overstate real-world exposure and risks. They are even more conservative when their screening levels are set at unrealistically low thresholds and their internal ("default") assumptions maximize projected impacts, defining "significant" impacts very stringently. (CIBO00052)

The groundwater modeling on which the analysis is based, according to peer review comments, has deficiencies in at least 13 steps, including but not limited to fracture flow, the understanding of the complex hydrogeologic conditions found in mine-land areas, and a tendency to overestimate leachate production rates and leachate concentrations. (CIBO00052)

The risk assessment that models the fate and transport of contaminants in ground water dramatically and falsely understates the real risks that are occurring from disposal of fossil fuel

wastes. The methodology used in the risk assessment that is based on EPACMTP modeling, is fundamentally flawed. There are errors of logic, of implementation, of programming, and simple quality control. These errors almost universally understate risks. Even under the conditions that the Agency purportedly models, the modeling undercalculates by orders of magnitudes the risks from FFCW, (See Use of EPACMTP to Estimate Groundwater Pathway Risks From Land Disposal of Selected Inorganic Compounds by Norris and Hubbard). (HEC00056)

At this time, USWAG finds it necessary to provide additional comment on EPA's risk modeling to specifically address comments filed by the Environmental Defense Fund (EDF). Those comments allege that EPA's modeling under-predicts concentrations of contaminants. However, those views are not based upon a plausible scientific foundation and do not stand up to simple field validation. EDF's comments are based upon a report by Noms & Hubbard designed to support the argument that EPA's model significantly understates the risk of coal combustion waste management. (USWAG00275)

In earlier comments, CIBO pointed out with specificity the many flaws in the models so heavily relied on by EPA. (CIBO00280)

There are significant deficiencies in each of the steps in EPA's assessment of the human health impacts of current FFC waste disposal practices. The cumulative effect of these deficiencies indicates that EPA has underestimated the human health impacts associated with exposure to FFC wastes, particularly to individuals with above- average exposures. (ALA00292)

The modeling that forms the basis of the recommendations fails to consider the strong bias impressed by natural and manmade geologic processes. (RICE00041)

The risk assessments are not adequate. There are several ways in which the risk assessment and exposure analyses contained in the Report are inadequate and inconsistent with Agency policy. (49CAO00058)

It appears that EPA's concern is based on the results of a model that indicates that the concentration of arsenic in groundwater at a receptor well could reach the health-based level of arsenic after 3,000 years. EPA's model, among other items, does not appear to account for the potential for these wastes to exhibit self-cementing properties leading to very low hydraulic conductivity ... Other issues raised by EPA's model were discussed in ARIPPA's 6/12/99 comments, which are incorporated herein by reference. (ARIPPA00273)

PG&E Gen's initial comments included risk assessment criticism of EPA's model and assumptions that were used to generate the remote risk to human health for arsenic from agricultural use of FBC coal ash. PG&E Gen's review identified numerous problems that cause the model to overestimate the potential risk presented by this beneficial use of coal ash, such as the choice of an inappropriate fate and transport model, unrealistic geochemical process

assumptions. (PG&E00274)

The bulk of the [USWAG] comments discuss ... the Norris and Hubbard report on EPACMTP modeling. These are the topics to which I will respond. (GHIL0012)

It is observed that the EPACMTP modeling results under-predict concentrations of metals relative to the observations in the real world data. (GHIL0012)

## Summary of MINTEQA2 Critique and Improvements to Isotherm Generation Method

Problems with USEPA's MINTEQA2 modeling		Implications	Improvement made for generation of revised isotherms
<b><i>Chemistry of the Basic Groundwater</i></b>			
1	Basic groundwater has a significant ion charge imbalance.	Modeled system cannot exist in nature.	Not addressed
2	Median values for concentrations of secondary variables from STORET database bear no geochemical relationship to one another.	Modeled system may not exist in nature.	Not addressed
3	Carbon, sulfur, iron and nitrogen are present exclusively in oxidized state.	Modeled groundwater unlikely to exist in nature for moderate to high soil organic matter contents.	Not addressed
4	Iron is present exclusively in oxidized state.	Iron sorbent capacity is maximized. Underestimation of metals mobility.	Not addressed
5	Mineral phases are not in equilibrium with groundwater.	Modeled groundwater not representative. Groundwater more typically in equilibrium with common carbonate minerals	Partially addressed by (6)
6	Input concentrations for calcium, magnesium, phosphorus, and sulfur are inappropriately low.	Total ion concentration is too low. Underestimation of competition for sorption sites and metal complexation by secondary variables.	Increased input to produce STORET values at equilibrium
7	Presence of iron and aluminum as mobile colloidal phases is ignored.	Underestimation of metals mobility.	Added entrained colloidal iron substrate
<b><i>Leachate Chemistry</i></b>			
8	Overall chemistry of the leachate not considered in isotherm calculations	Leachates are typically high in dissolved ions. USEPA approach underestimates ion competition for sorption sites and metal complexation by secondary variables.	Not addressed
9	Possible presence of other contaminant metals in leachate is ignored	Underestimation of competition for sorption sites.	Not addressed
10	Subsurface system assumed to be buffered with respect to pH, regardless of the chemistry of the leachate and location of waste	Ignores ability for pH of leachate to overwhelm the buffering capacity of the soil and aquifer system at some sites. Underestimation of metals mobility.	Not addressed
<b><i>USEPA Master Variables</i></b>			
11	pH cutoff values for CMTP arbitrarily set at boundaries with no geochemical significance.	For pH between 5.85 and 6.35, CMTP will underestimate risk.	Not addressed
12	Lack of isotherm set for carbonate-dominated waters (pH greater than 10.33).	For pH greater than 10.33, CMTP will underestimate risk.	Not addressed
13	Surface area for iron substrate inappropriate for soil particles and soil environments.	Overestimation of sorptive capacity of immobile substrate. Underestimation of metals mobility.	Surface area of FeO <sub>x</sub> reduced to more appropriate value
14	Concentration range for iron substrate may be unrepresentatively high.	Over estimation of sorptive capacity of immobile substrate. Underestimation of metals mobility.	Not addressed
15	Unexpectedly small relative influence of LOM on K <sub>d</sub> values	Facilitated transport of metals by LOM potentially masked by excessive influence of natural substrates in USEPA system.	Not addressed
16	POM and DOM are inappropriately assumed to have equivalent sorption site densities	POM should have fewer available reaction sites because of its larger size and lower specific surface area. Underestimation of metals mobility	Not addressed
17	Charge balance of all POM species is arbitrarily forced to zero, increasing the reactivity of POM relative to DOM	Higher reactivity produces greater sorption on immobile POM. Underestimation of metals mobility.	Not addressed
18	POM variable is behaving incorrectly, exhibiting a relative decrease in sorption with increasing particulate organic matter.	Either an overestimation or an underestimation of metals mobility, depending on values of K <sub>d</sub>	Not addressed
<b><i>Calculation Errors</i></b>			
19	Programming error in treatment of particulate organic substrate (see 15)	Unclear how risk calculations will change when this error is addressed	Not addressed
20	Miscalculation of the saturated zone values of K <sub>d</sub> for lead (incorrect soil-liquid ratio)	Underestimation of lead mobility	Saturated zone lead isotherms recalculated with correct ratio

## **XV. GROUNDWATER RISK MODELING**

### **A. Model Design In General**

EPA's groundwater model, EPACMTP, was subjected to careful review by stakeholders on both sides of today's rulemaking. The following captures the essence of this review.

Industry commenters stated that prior SAB review of the model concluded that the model needs validation and has deficiencies in manifesting an understanding of the complex hydrogeologic conditions found in waste placement areas with the resultant tendency to overestimate leachate production rates and leachate concentrations. Other specific design concerns raised by industry commenters included the following: the model uses insufficient thermodynamic data for metal species and interactions; the model does not account for the effect of redox potential on metal speciation and mobility; the model has the potential to produce initial concentrations for metals that exceed known chemical solubilities; and the model does not address the situation in which a background concentration of the metal of concern exists in either the vadose or saturated zone. One of these commenters suggested that the Department of Energy (DOE) has developed technically sophisticated models to assess certain complex geologies and that EPA should coordinate with DOE to improve its model design.

Public interest group commenters also raised specific questions about the design of the model. These included the following major concerns: The model incorrectly assumes an unsaturated soil zone that will absorb contaminant metals; the model assumes there is no change to ground water except for the addition of one RCRA metal as a contaminant (thus ignoring metals loading from multiple contaminants that compete for a finite number of adsorption sites); the model assumes ground water will remain buffered with respect to pH and not change as a result of waste leachate; and the model produces a virtually inexhaustible and unrealistic pollution sink in the unsaturated zone. One of these commenters provided a detailed technical report documenting model deficiencies that may have led to an underestimate of risk.

Response: As a direct result of comments received, EPA/OSW and EPA/ORD are engaged in an item-by-item review of EPACMTP and its metals partitioning component, MINTEQA2. As appropriate, we will review other modeling approaches. While it is not known at this time whether risk estimates will change, either up or down, EPA expects when the review is completed to have greater assurance of the model's reliability. The review may result in a reevaluation of the potential groundwater risks posed by management of fossil fuel combustion wastes and EPA action to revise today's determination, if appropriate. Specific comments are addressed below, but in many cases must await the model/MINTEQ review already noted.

**XV. GROUNDWATER RISK MODELING**  
**A. Model Design in General**  
**Verbatim Commenter Statements**

However, when attempts to apply it to site specific or regional applications, many of which are very complex due to pre-existing deep mines, the over simplifications that are required to be made in order to make it function result in “high-end” scenarios that are not only unrealistic but which violate basic scientific principals. (ARIPPA00019)

If we are to assess the “quality” of the EPACMTP risk assessment code, we can only judge it on the basis of the public documents provided by the EPA. The latest retrievable citation to this code is EPA-SAB-EEC-95-010, which constitutes a peer review of the code initiated by the EPA. In this review, the committee is critical of the coding and has recommended 13 steps to insure its validity. Since this recommendation is the last public reference to the code, we can not make any assumptions on the status of the implementation of the peer committee’s recommendations and can only go by the peer review committees published statements. (ARIPPA00019)

Recent publications by Nishimura and Robins [1998] and Bothe and Brown [1998,1999] both contribute new thermodynamic data relating to the solubilities of calcium arsenate compounds. Indeed these new data support the identification of new compounds in the phase stability ranges that encompasses the chemical and environmental conditions under consideration in this review. The Ground-Water Pathway Human Health Risk Assessment suggests that only 16 metal species were considered in the modeling activity. This restricted use of thermodynamic data is clearly inadequate especially in light of the importance of ion pairing in this predictive calculation and the impact of ionic strength. Additionally, Eh can and does play an important role for poly-valent metals where solubilities can vary significantly for different valence states e.g. the EPA’s re-evaluation of chromium. (ARIPPA00019)

Insufficient thermodynamic data for metal species and their interactions were considered in the model. (ARIPPA00019)

The assessment that is required of EPA is not at all different from the activities that are being undertaken for the assessment of a Federal nuclearwaste repository. The performance assessment groups must deal with release and the transport and fate of radionuclides in the environment. This community of researchers has developed models that address fluid flow in fractured media, in saturated and unsaturated zone and structurally complex geology. Both the Performance Assessment Group at Sandia National Laboratory and Argonne National Laboratory -- West have the capabilities to conduct such risk assessments and have performed them on comparably complex designs. Golder Associates of Seattle, WA have developed what appears to be the code that will establish the benchmark for all future assessment calculations. Lawrence Livermore Laboratory

has for decades maintained the state-of-the-art geochemical codes for thermodynamic calculation of reaction pathways. Perhaps inter-agency cooperation between the DOE and EPA is appropriate at this point. (ARIPPA00019)

The mobility of metals is also largely dependent upon metal speciation. The redox potential or oxidation/reduction potential (ORP) of the surrounding aquifer materials determines the speciation of a metal (Deutsch, 1997). The EPACMTP model does not account for the effects of ORP on metal specification, and hence, mobility. Natural changes in the speciation can significantly further decrease the dissolved metal concentration downgradient from source areas. (PG&E00023)

While EPA claims EPACMTP was reviewed by EPA's Science Advisory Board (SAB), this assertion is only partially true. In fact, MINTEQA2 was expressly not evaluated, and SAB indicated "the accuracy of the model estimates must be verified and the documentation of this use needs to be clarified". Therefore, SAB has not reviewed one of the most crucial components of EPA's groundwater modeling underlying the Report to Congress. (EDF00021)

As the CKD experience demonstrates, the releases from these large volume waste disposal units can overwhelm any neutralization capacity the uncontaminated groundwater may offer, and thus background pH offers only temporary protection in such circumstances. In ascertaining "potential" risks, it is appropriate for EPA to assume the groundwater underneath and in close proximity to the management units will reflect the pH of the waste when large quantities of waste is disposed in or near or the water table. (EDF00021)

In effect, the errors in EPA's modeling for the Report to Congress produce a virtually inexhaustible and unrealistic pollution sink in the unsaturated zone, effectively capturing most of the pollutants so that they never reach the groundwater. (EDF00021)

EPA's CMTP groundwater fate and transport model is ill-suited for modeling some of the complex physical-chemical phenomena present in the utility waste management units under study. In particular, the model's defects preclude accurate modeling of arsenic fate and transport. (USWAG00037)

The groundwater modeling on which the analysis is based, according to peer review comments, has deficiencies in at least 13 steps, including but not limited to fracture flow, the understanding of the complex hydrogeologic conditions found in mine-land areas, and a tendency to overestimate leachate production rates and leachate concentrations. For example, the peer review panel recognized in 1995 that the model had the potential to produce initial concentrations for metals that exceed the known chemical solubilities. The Science Advisory Board (EPA-SAB-EEC-92-003) first disclosed this defect in 1992. Again in its draft of the Ground-Water Impact Assessment Document, EPA freely admits that it "most likely overestimated leachate generation and leachate concentrations." Furthermore, no mechanism appears to be available to address the situation in which a background concentration of the metal of concern exists in either the vadose or saturated



zone, thus further exacerbating the overestimate of leachate generation and its impact.  
(CIBO00052)

To cite but one flaw, one cannot determine whether the EPA CMTP risk assessment code utilized by EPA included the utilization of the 13 steps recommended by the peer review committee. This flaw is fully explained in materials prepared by Professor Barry E. Sheetz (Pennsylvania State University), which have been submitted to EPA. (CIBO00280)

We recommend that EPA refer to the Agency's Soil Screening Guidance that addresses the risks associated with ground water contamination from contaminants leaching from soil. This guidance provides an extensive review of the EPACMTP model and other unsaturated zone models that was conducted by EPA's ORD laboratories in Oklahoma and Georgia (EPA, 1998, pages 68-80).  
(ALA00292)

## **XV. GROUNDWATER RISK MODELING**

### **B. Precipitation/co-precipitation**

Several industry commenters indicated that EPACMTP is not capable of modeling the significant precipitation and co-precipitation phenomena that they believe takes place in waste management units. As a result of not considering these natural attenuation phenomena, industry argues contaminant transport was overestimated and risks, therefore, were overestimated.

Response: The extent of precipitation/co-precipitation occurring will be governed by chemistry of the vadose zone and the saturated zone, and EPA acknowledges that the methodology for calculating this may be improved as part of the examination of broader geochemical interactions as planned for the overall model review. Precipitation and co-precipitation are dependent phenomena. This issue is discussed further under Topix XV.L, below.

**XV. GROUNDWATER RISK MODELING**  
**B. Precipitation/co-precipitation**  
**Verbatim Commenter Statements**

The concentration of dissolved metals can be attenuated in the subsurface environment by three main processes: 1) dispersion, 2) adsorption, and 3) precipitation (Deutsch, 1997) as well as others (McLean and Bledsoe, 1992). The EPACMTP model assumes that metals undergo attenuation by dispersion and adsorption and does not account for the effects of precipitation. This is a shortcoming because the precipitation of metal minerals in the subsurface has been well documented to occur naturally (Deutsch, 1997; Lindsay, 1979; McBride, 1980; McLean and Bledsoe, 1992; Rai, et al., 1987; and Sposito, 1989) and can significantly decrease the metal concentrations in groundwater downgradient from source areas. (PG&E00023)

EPA modeling did not consider all natural attenuation factors ... The model appears to neglect co-precipitation with iron or adsorptive processes on soils or even the coal combustion product itself. In my work I have found these processes to be extremely significant. (NM00024A)

While CMTP can model adsorption and desorption effects, it cannot account for precipitation and co-precipitation, which are significant processes that are undeniably occurring in the waste management units. In the co-management unit and mine placement contexts, these chemical processes are controlling.” Without consideration of attenuation by precipitation and co-precipitation, EPA used the input porewater concentrations obtained from within the waste management unit or mine in effect to represent the leachate emerging from the unit. As a result, the modeled dilution and attenuation factors (“DAFs”) are much lower than the real world data demonstrate. (USWAG00037)

CMTP is not capable of modeling the geochemistry that occurs in the waste management units under study. Precipitation and co-precipitation of arsenic in co-management units is a significant and well-understood process. The oxidation of pyrites in the waste management unit yields a low pH and high concentrations of iron. When the resulting acidic leachate flows through the ash, neutralization and co-precipitation occur very rapidly and within a short distance. This geochemical process is very clearly demonstrated in the vertical concentration distribution in porewater samples. The full data set indicates that concentrations attenuated rapidly downward through the sample before the water table was reached. The high end value of 9.64 mg/L chosen by EPA is two orders of magnitude higher than the value measured at contact with the water table. Figure 4-5 of the MO report shows that the arsenic concentration dropped to approximately 0.025 mg/L vertically through the sample core. Since the model does not perform an attenuation calculation, EPA has effectively multiplied the arsenic concentration entering the water table by two orders of magnitude. Dr. Paul labeled EPA’s failure to account for this natural attenuation a “technical catastrophe.” (USWAG00037)

In light of the field data and knowledge of the prevalence of precipitation and co-precipitation in these units, EPA used unrealistically low, fixed values for distribution coefficient (Kd) for several metals. The low Kd resulted in an unnecessarily long modeled transport distance and high modeled concentration of constituents in groundwater. The retardation factor (Rd) value (calculated based on an assumed Kd value) used by EPA is representative of reversible arsenic adsorption reactions but not irreversible precipitation and co-precipitation reactions. The EPRI field data indicate that precipitation and co-precipitation are the controlling reactions. (USWAG00037)

APS strongly agrees with USWAG's position that ... precipitation and co-precipitation are significant processes occurring in waste management units, and the use of the model Composite Model for Leachate Migration with Transformation Products (CMTP), as applied, is inappropriate since CMTP can not account for these processes. (APSC00043)

The risk assessment that models the fate and transport of contaminants in ground water dramatically and falsely understates the real risks that are occurring from disposal of fossil fuel wastes. The methodology used in the risk assessment that is based on EPACMTP modeling, is fundamentally flawed. There are errors of logic, of implementation, of programming, and simple quality control. These errors almost universally understate risks. Even under the conditions that the Agency purportedly models, the modeling undercalculates by orders of magnitudes the risks from FFCW. (See Use of EPACMTP to Estimate Groundwater Pathway Risks From Land Disposal of Selected Inorganic Compounds by Norris and Hubbard). (HEC00056)

The agency modeling assumes an unsaturated soil zone beneath the site that will absorb contaminant metals before they reach groundwater, and a saturated aquifer of clean water that will serve to dilute contaminants. These assumptions ignore the fact that FFCW, and CCW in particular, are sometimes currently disposed and are proposed to be disposed in a setting below the water table and where the waste mass itself replaces the entire thickness of the aquifer(s). The agency assumes there is no change to groundwater except the addition of one RCRA metal as a contaminant. This assumption ignores the fact that metals loading from multiple contaminants compete for a finite number of absorption sites. (HEC00056)

The Agency modeling assumes a pristine soil and a dilute groundwater, with no natural, pre-disposal loading of absorption sites. This assumption ignores natural soil conditions and the fact that millions of tons of FFCW disposed in lagoons and monofills below the water table will not leave the natural groundwater chemistry intact. Rather, the leachate will displace natural groundwater with vastly higher concentrations of contaminants other than RCRA metals. Studies performed for EPA's Determination on cement kiln dust (CKD) demonstrated the enhanced migration and increased risk afforded by leachates with high dissolved solid loads, but these lessons are ignored in this Determination. (HEC00056)

The Agency modeling assumes the natural groundwater will remain buffered with respect to pH. This assumption ignores the fact that natural groundwater used in the exercise has very little buffering capacity and the mountainous masses of wastes not only generate dangerous pHs but also incredible concentrations of alkalinity or acidity. This choice to ignore this fact is, again, in spite of what was learned with the earlier CKD determination. And, while FFCWs can range from alkaline to acidic, the ability of soil to retard contamination migration is highest in the neutral range modeled by the agency and lowest at both the low and high pH ranges demonstrated by the FFCW. (HEC00056)

## **XV. GROUNDWATER RISK MODELING**

### **C and D. Constant Source and Ultimate Leachability**

Several industry commenters stated that the model inappropriately used a constant source concentration, while actual source concentrations should decline over time. Commenters also expressed concern that the model appeared to assume that 100 percent of the mass of trace constituents is available for leaching, and suggested that only 10 percent of the constituents in CCW are leachable.

Response: EPA agrees that the 'constant source' assumption may be conservative, depending on the total contaminant available, and configuration and life of the waste unit.. The commenters correctly state that EPACMTP uses a constant source concentration for the landfill scenario. The concentration of the contaminant as well as the infiltration rate (leachate generation rate) are both held constant for the duration of the study period. EPA acknowledges that these assumptions would overstate risk if the actual leachate concentration from the management unit decreases over time.<sup>28</sup>

The Agency did not assume 100 percent availability for every management scenario. For surface impoundments, the model assumes a constant leaching rate for the life of the impoundment, while for landfills, the model assumes a constant leaching rate for the study period or until 100 percent of the contaminant is released from the management unit, whichever comes first. EPA has conducted follow-up analyses to verify that these scenarios did not overstate the quantity of constituents available for leaching. For all constituents showing a risk greater than  $10^{-6}$  or HQ=1 in the June 1998 report for any scenario, a mass balance was conducted to determine if the total quantity of contaminant that leaches out was less than the maximum quantity that reasonably be placed in the unit.

Results of these analyses are presented in the October 1998 Sensitivity analysis.<sup>29</sup> In this analysis, the total quantity of contaminant released from the landfill scenario as assumed by the model was found to be no more than 13 percent for the principal contaminants of interest, which is consistent with the leachable proportion of 10 percent suggested by the commenter. These percentages are based on the initial leachate concentrations presented in the June report; lower concentrations were used in the October revised analyses. The percentages for the October analyses, if calculated, would be even lower than those presented here.

For the surface impoundment scenario, the results show that 33 percent of arsenic would be released under the model assumptions in the impoundment scenario. EPA conducted a sensitivity analysis for the impoundment infiltration rate which can be used for assessing the commenter's

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<sup>28</sup> FF2P-S0363, Section 8.

<sup>29</sup> FF2P-S0361, Attachment 6 (Sensitivity Analysis): Mass Balance Check.

suggestion that 10 percent leachability would be more reasonable. The results of this sensitivity analysis are presented in the October 1998 report.<sup>30</sup> The results suggest that the peak concentration, and therefore the risk, would decrease by approximately 3.3 times using this assumption (i.e., the sensitivity analysis suggests a linear relationship between peak receptor concentration and infiltration rate). This would decrease the high-end receptor risk from  $5 \times 10^{-4}$  to about  $2 \times 10^{-4}$ .

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<sup>30</sup> FF2P-S0361, Attachment 6 (Sensitivity Analysis): Hydraulic Conductivity of Surface Impoundment Liners.

**XV. GROUNDWATER RISK MODELING**  
**C and D. Constant Source and Ultimate Leachability**  
**Verbatim Commenter Statements**

The model defines the concentration of metals present in the ash and then assumes a linear release with time. This erroneous assumption can result in a total inventory of metals released that exceeds the original inventory of metals specified in the model. The linear release of the metals over an arbitrary time interval has no scientific basis. (ARIPPA00019)

Because of the inconsistency in the availability of data, EPA chose to make sweeping assumptions in order to implement the modeling. The impact of this action is to effectively provide an infinite source of metals with infinite availability to groundwater, which can also result in a total inventory of metals released that exceeds the original inventory of metals specified in the model. The linear release assumption presupposes a zeroth order dissolution mechanism for the constituents of the FBC ash when in reality the mechanistic controls are diffusion related. A review of the data presented to the EPA by CIBO and the accompanying ARIPPA data clearly demonstrate the 3- to 4-order of magnitude difference in the bulk content of arsenic in the FBC ash and the arsenic that is released upon leaching that can be expected. The presence of a metal in the solid waste does not necessarily mean that it is labile when placed in contact with water. Data in the scientific literature published since this review would support the observations made by CIBO and ARIPPA. (ARIPPA00019)

An incorrect dissolution mechanism for the FBC ash is used. (ARIPPA00019)

The metals in the ash are not released linearly over time as the model assumes. (ARIPPA00019)

The models used a constant source concentration while real coal combustion products exhibit order of magnitude plus declining concentrations ... The computer models used by EPA in their risk assessment did not reach the well concentrations used for evaluation for 500 or 3000 years or more at constant leachate source concentration. Coal combustion products could not be expected to maintain the source concentrations at these original levels for even the right order of magnitude in the number of years to support this outcome. The model is thus spitting out data that simply cannot happen outside of a programmed microchip. (NMA00024A)

The computer model assumed that all of the trace metals in a mostly vitrified material were leachable. Under ordinary water leaching conditions, a glass phase can be one of the most "leach proof" structures into which trace elements can be placed ... Although the EPA drew heavily on EPRI reports to obtain the concentration data for their database, it appears the parts of those reports stating that only around 10% of the elements in a typical coal combustion product were leachable got lost somewhere before the data reached the input lines of the model. (NMA00024A)



One related problem with the analysis is that trace elements concentrations in the solids was set using a ratio of leachate to solid concentration at either the median or 95<sup>th</sup> percentile. To say that trace element concentration in a solid is a linear function of initial concentration requires a leap of faith I could not make, especially when I had a set of data on directly measured concentrations in the solids. (NMA00024A)

EPA inappropriately used a constant source concentration. In the real world, coal combustion waste constituent source concentrations are expected to decline by an order of magnitude or greater over a short period of time. However, EPA's modeling exercise assume a constant high-end source term. The decaying source term concentration is readily apparent by reference to the coal combustion process. Combustion of coal results in vitrification of much of the ash, producing a leach resistant glass phase. Mineral phases settle and condense in layers around the glass nuclei, resulting in a layered structure. The outer layers have a very porous structure that provides a high surface area and high leachability. However, the inner layers are more resistant to leaching. As a result, open column leach testing of coal ash generally exhibits rapid arsenic leaching from the outer layers, followed by a decline to non-detect levels after several months. (USWAG00037)

EPA Incorrectly assumed total availability of arsenic in coal combustion wastes for leaching. EPRI reports demonstrate that only approximately 10% of the constituents in a typical coal combustion waste are leachable. Nonetheless, EPA's modeling assumed that 100% of the mass of trace constituents is available for leaching. This single erroneous assumption resulted in excessive modeled risk by an order of magnitude. (USWAG00037)

Professor Sheetz further expressed concern about the method in the model for defining the concentration of metals in the ash and assuming a linear release time: "This erroneous assumption can result in a total inventory of metals released that exceeds the original inventory of metals specified in the model. The linear release of the metals over an arbitrary time interval has no scientific basis." As part of this discussion, Professor Sheetz pointed out that a review of data presented to EPA by CIBO and the accompanying ARIPPA data clearly demonstrate the 3 -to-4 order of magnitude difference in the bulk content of arsenic in the FBC ash and the arsenic that is released upon leaching that can be expected. (CIBO00280)

## **XV. GROUNDWATER RISK MODELING**

### **E. Duration of Modeling**

An industry commenter suggested that modeling to a time horizon of 10,000 years was too long a period (given, for example, uncertainty about climatic conditions), and suggested a period of 100 years would be more appropriate. In contrast, a public interest group commenter expressed concern that the modeling accounted for release during an impoundment's active lifetime only, without accounting for a post-closure period that may have been preceded by impoundment drainage and reclamation.

Response: EPA disagrees that a 100 year time frame should be used in evaluating receptor risks from landfill disposal of fossil fuel combustion wastes. EPA believes such a time frame to be far too brief. EPA has used the 10,000 year time period assumption in other solid waste risk assessments for landfill disposal. EPA reported both the peak receptor well concentration and the time to reach this concentration in the Report to Congress, in order to show the time period for which risks may be anticipated.

It is true that EPACMTP assumes that releases from a surface impoundment end at the end of the impoundment's useful life. In other words, the model assumes that impoundments are dredged and clean-closed. In some cases, however, fossil fuel combustion wastes managed in a surface impoundment may be left in place, rather than removed, at closure. In these cases, releases might continue after closure, but would not be considered by the modeled impoundment scenario. EPA believes that the release mechanisms during the post-closure period of a surface impoundment would be similar to those from a landfill. For each waste where a surface impoundment scenario was modeled, EPA also modeled a landfill scenario. While there are some differences in the input parameters used between the two scenarios, EPA believes that the landfill scenarios provide a reasonable bound on the risks that would be expected from surface impoundments in the post-closure period.

EPA believes that factors that would tend to under- or overestimate transport are in general balanced, within the state of the art of nationwide ground-water risk assessment. (See response to Topic XV.L, below)

## **XV. GROUNDWATER RISK MODELING**

### **E. Duration of Modeling**

#### **Verbatim Commenter Statements**

As described in Table A-4 (page A- 13) of the Technical Background Document for the Supplemental Report to Congress on Remaining Fossil Fuel Combustion Wastes: Ground-Water Pathway Human Health Risk Assessment (revised Draft Final, June 1998), the source for recharge (RCHRG) and infiltration (SINFIL) rate input parameters is historical (throughout the last 60 years) climatological data generated from the HELP model. The assumption that these rates remain constant over the length of the study period (10,000 years) is highly unlikely. For example, 10,000 years ago the earth was near the end of the last Ice Age and large portions of the globe were under sheets of ice at least one mile thick (Press and Siever, 1974; Montgomery, C.W., 1990). The uncertainty in the variation of climatic conditions over a 10,000-year period leads to a large uncertainty in the predicted concentrations of metals in the receptor well. These time durations are unrealistic and add yet another layer of conservative assumptions than is typical in models. A more practical time duration used in fate and transport modeling is 100 years. (PG&E00023)

For onsite surface impoundments for coal- and oil-fired managed waste, EPA assumed that the leachate is released during the active lifetime of 40 years for the waste management unit only. At the end of the operational life, it was assumed that leaching would cease and all waste would be removed from the impoundment. The model did not account for a post-closure period that may have been preceded by impoundment drainage and reclamation. For the onsite landfill for coal- and oil- fired managed waste, no leaching would take place during the operational life of the unit (40 years). At the close of the landfill, the unit would be capped and leaching would begin at a constant infiltration rate and an initial leachate concentration. (ALA00036)

Waste management unit scenarios assumed no leaching from active unlined impoundments over a 40 year period. For landfills it assumes no leaching during the operational life and that leaching would begin at a constant infiltration rate and leachate rate at the end of the active life of the unit. (ALA00292)

## **XV. GROUNDWATER RISK MODELING**

### **F. Hydraulic Conductivity**

Industry commenters disagreed with the hydraulic conductivity input values used in modeling. Specifically, the comment noted that modeling did not address the physical and chemical properties of FBC wastes that may result in much lower conductivity and hence lower infiltration rates for these wastes. The commenters stated that this omission resulted in hydraulic conductivity being overstated by 2 to 3 orders of magnitude.

Response: The characteristics of FBC wastes may be different than those used in its modeling, as suggested by the commenter.<sup>31</sup> Such effects might result in modeled receptor well risks lower than those calculated by EPACMTP. However, the potential variance in wastes, for which no data were available, made estimating such differences problematical. This was acknowledged in the RTC in which it was stated that FBC risk as calculated by the model may be overstated for this reason. (As noted elsewhere in this set of responses to comments, EPA believes the likelihood of either over- or underestimating modeled risk to be approximately equal, all factors considered, pending review of the model.) While EPA agrees with the commenter's suggestion that the hydraulic conductivity is probably lower for FBC wastes, sufficient data were not available to determine a more appropriate value for this parameter. EPA reported the results of sensitivity testing of this variable in its October 1998 sensitivity analysis, and agrees, if groundwater modeling is re-visited, to re-examine this issue..

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<sup>31</sup> FF2P-S0363, Sections 7 and 8.

**XV. GROUNDWATER RISK MODELING**  
**F. Hydraulic Conductivity**  
**Verbatim Commenter Statements**

EPA's model does not take into consideration any of the characteristics of the FBC ash that beneficially contribute to retention of metals. (ARIPPA00019)

The modeling activities of EPA also did not take into consideration the physical characteristics of the engineered ash minefills. A properly placed FBC minefill develops physical characteristics that begin to approach the properties of portland cement concrete; modest strength [1200psi to 4500psi], a monolithic structure [i.e. minimization of surface area for contacting waters] and low hydraulic conductivity [10<sup>-5</sup> to 10<sup>-7</sup>cm/sec]. All of these characteristics contribute to a significant reduction of labile metals to contacting groundwater. In contrast, the EPA modelers assumed a lateral hydraulic conductivity for the placed ash of 300m/y [1 x 10<sup>-3</sup>cm/sec] which is fully 2- to 3-orders of magnitude larger than what might be anticipated in engineered minefills composed of FBC ash. (ARIPPA00019)

The high compaction and cementitious behavior of the ash and its resultant low hydraulic conductivity are not properly considered. (ARIPPA00019)

The hydraulic conductivity of the placed ash was overstated by 2 to 3 orders of magnitude. (ARIPPA00019)

The model failed to account for the beneficial ongoing reaction of the lime (CaO) and the Anhydrite (CaSO<sub>4</sub>) in the presence of water. The lime (CaO) will react with water to form Ca(OH)<sub>2</sub> that further produces cementitious reactions. In addition, the Anhydrite reacts with water to form Gypsum (CaSO<sub>4</sub> + 2/H<sub>2</sub>O). The presence of the lime (CaO) and Anhydrite (CaSO<sub>4</sub>) and their on-going reactions with water along with the interactions with aluminosilicates from calcined clays provide the ash with some of its beneficial physical properties, such as compressive ash strengths measured of 1000 to 4000 pounds PSI; expansive nature due to "hydration reactions;" self-cementing properties; high densities and very low permeabilities; and highly alkaline quality. (CIBO00052)

It appears that EPA's concern is based on the results of a model that indicates that the concentration of arsenic in groundwater at a receptor well could reach the health-based level of arsenic after 3,000 years. EPA's model, among other items, does not appear to account for the potential for these wastes to exhibit self-cementing properties leading to very low hydraulic conductivity. This apparent oversight is far from trivial, and renders the results of EPA's model and risk assessment invalid. The cementitious nature of the ash from a waste coal plant is such that, if a truck back-hauling ash to a mine site has a flat tire and is delayed by more than a couple of hours, the ash has to be jack-hammered out of the truck. In short, CFB ash has

physical characteristics that begin to approach the properties of Portland cement concrete, including a hydraulic conductivity of  $10(-5)$  to  $10(-7)$  cm/sec. Other issues raised by EPA's model were discussed in ARIPPA's 6/1 2/99 comments, which are incorporated herein by reference. (ARIPPA00273)

## **XV. GROUNDWATER RISK MODELING**

### **G. Dispersivity**

USWAG suggested that EPA selected artificially low values for transverse and longitudinal dispersivity.

Response: In its evaluation of comanaged coal combustion wastes, EPA used a longitudinal dispersivity value of 4.64 m and a transverse dispersivity value which is 1/8 of this value<sup>32</sup>. The dispersivity values used in the model were the median values based on a scale dependent dispersivity distribution given by Gelhar.<sup>33</sup> The value of 4.64 m was selected because this represented the 50<sup>th</sup> percentile from this data.<sup>34</sup>

EPA also conducted a sensitivity analysis to examine the effects of changing dispersivity values on results. It conducted this analysis using a longitudinal dispersivity value of 68 m/y, which is consistent with the value recommended by the commenter. For the comanaged coal combustion wastes in both a landfill and a surface impoundment, the effect of this parameter on receptor well concentration was found to be much less than the effect of other parameters.<sup>35</sup>

EPA notes that in its Monte Carlo analysis the full distribution of dispersivity values (from the Gelhar source) were used. These results were presented together with the deterministic high-end results.<sup>36</sup>

EPA notes that, ceteris paribus, an increase in longitudinal dispersivity may increase longitudinal contaminant transport. Of course, this may be offset by reduced concentration if in fact a higher value is selected for transverse dispersivity as well.

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<sup>32</sup> FF2P-S0363, Table A-1.

<sup>33</sup> Gelhar, L.W.; C. Welty; K.R. Rehfeldt. A Critical Review of Data on Field-scale Dispersion in Aquifers. Water Resources Research, 28(7). 1992.

<sup>34</sup> See discussion in EPA's Composite Model for Leachate Migration with Transformation Products, EPACMTP User's Guide, 1995, Section 6.5.9. This discussion references L.W. Gelhar, C. Welty, K.R. Rehfeldt, A Critical Review of Data on Field Scale Dispersion in Aquifers, Water Resour. Res., 28(7), 1992.

<sup>35</sup> FF2P-S0363, Appendix K (Table K-3).

<sup>36</sup> FF2P-S0363, Section 5.

**XV. GROUNDWATER RISK MODELING**  
**G. Dispersivity**  
**Verbatim Commenter Statements**

EPA selected artificially low dispersivity values. For example, EPA set the value for longitudinal dispersivity at 4.84 m, whereas a value in excess of 15 m would be reasonable. Transverse dispersivity values are likewise unrealistic. The combination of increased dispersivity and higher values for Kd (to reflect the chemical precipitation process discussed above) would yield higher DAFs that better reflect real world conditions and that will be corroborated by real world data. (USWAG00037)



## **XV. GROUNDWATER RISK MODELING**

### **H. Well Locations not Realistic**

Industry commenters stated that the assumption of a well location of 150 meters away and on the centerline of the plume was unrealistic. One of the commenters suggested that real well locations are on the order of kilometers away. A public interest group commenter believed that this fixed well location was not justified with any information about actual well locations and stated that EPA should conduct a review of actual well locations. This commenter further stated that the receptor well location was changed to 430 meters for EPA's October sensitivity analysis and stated that the available data demonstrate receptors living much closer than this distance.

Response: As one of its high-end assumptions, EPA selected a well location which was 150 meters from the source, on the plume centerline. The results of its sensitivity analyses suggest that well location is very important in determining receptor exposure, and therefore was set equal to this high-end value to maintain a conservative analysis. The public interest group commenter is correct that some of the scenarios modeled in the October sensitivity analysis<sup>37</sup> used a well location of 430 meters. These scenarios were the deterministic central tendency scenarios used in the sensitivity analysis to provide estimates of central tendency risk. These scenarios, therefore, appropriately used a central tendency estimate for well location. The high-end scenarios modeled in the October sensitivity analysis and presented in the Report to Congress, however, all used a high-end receptor well location of 150 meters.

EPA found that its data characterizing receptor well distances from fossil fuel combustion management units is incomplete. In the absence of such information, EPA is using the well distances from the Subtitle D Survey Database, used for the 1995 HWIR analyses. EPA is also employing this data because wells may be placed closer to the waste management unit in the future, over the study period. For these reasons EPA relied on distances obtained from the OSW database as representative of potential well locations at the high end.

EPA notes that in its Monte Carlo analysis, the full distribution of available receptor well distances was used including wells at distances up to one mile and off of the plume centerline. These results were presented together with the deterministic high-end results.<sup>38</sup>

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<sup>37</sup> FF2P-S0361.

<sup>38</sup> FF2P-S0363, Section 5.

**XV. GROUNDWATER RISK MODELING**  
**H. Well Locations Not Realistic**  
**Verbatim Commenter Statements**

As the second of the two most important parameters that control the outcome of the deterministic risk assessment calculation, the model assumes, as a “high-end” scenario, that an adult individual places a well directly into the water table 150 yards along the down-gradient flow path from the fly ash site. Break through calculation show that the transit times to this well are measured mostly in the thousands of years, with the exception of arsenic, which was 500 years. The decision to select this distance is therefore extremely critical to the outcome of the model. Place it a little farther away and the transit time increases. In the CIBO survey, proximity to the ash site is generally measured on the order of kilometers, or approximately an order of magnitude farther away from the fly ash source than was used in the model. (ARIPPA00019)

The likelihood of a drinking water well being placed 150 meters on plume centerline are infinitesimally small and, therefore, the predicted contaminant concentrations and the time for them to reach the receptor well are greatly overstated. (PG&E00023)

EPA well locations are probably not realistic ... EPA set the location of the critical well just 150 meters away from the edge of the coal combustion product fill. Although EPA modeling of mine sites was limited and more of an interpolation off of the impoundment results the notion that the users well is 150 meters away is highly questionable given typical State regulatory programs for mine sites in the Midwest. (NMA00024A)

In the groundwater risk assessment EPA used a fixed well location at the 50<sup>th</sup> percentile — or 430 meters — without justification. There are no data to indicate the extent to which this is a realistic value or whether there are receptor wells located closer to waste management units. EPA does not provide data that are available on groundwater contamination around these waste management units. In addition, this major change occurred after the draft risk assessment was subject to peer review (SAIC memo, 1998). This change resulted in reducing the risk estimates for groundwater ingestion posed by FFC waste. (ALA00036)

EPA assumed that the adult resident (and child) drank tap water derived from ground water that had been contaminated by the migration of metals to a receptor well 430 meters from the WMU (about one-quarter of a mile). EPA’s sensitivity analysis detemlined that the waste concentration and the receptor well location are the driving parameters in the risk assessment. In the October 1998 risk assessment supplement the contractor reported that the receptor well location was extended from 150 meters to 430 meters. The contractor states that the 430 m value corresponds to the 50th percentile used in the HWIR analysis (SAIC, 1998). Since receptor well location is critical to estimating risks associated with FFC w’astes, it seems appropriate for EPA to justify

this significant change in the risk assessment to a less conservative distance at the 50th percentile. This is particularly important since drinking water wells have been reported to be 150 feet from waste management units surveyed in the site investigations. (ALA00292)

The Agency has not, to date, analyzed the proximity of private drinking water wells to FFC waste management and disposal facilities. It is clearly a responsibility of the Agency to conduct such a review. It is likely that either the Agency or industry has already obtained this information for at least some facilities. In a memorandum to the docket, SAIC describes one site as having 17 wells within 1 mile, with the closest within 150 feet of the facility. Another memorandum states that 415 people using well water within 1 mile of that facility, yet EPRI had characterized only 5 wells. SAIC recommended that EPRI better characterize the wells near this site. A third example is yet another SAIC memorandum to EPA that describes a site as having numerous wells within 1 mile, with groundwater being affecting to 600 feet from the facility. With this information in hand, why did the EPA choose the receptor well for the groundwater analysts to be 1,477 feet (450 meters) from the facility? Secondly, why has the Agency not conducted a review of private drinking wells near these facilities when it has had some knowledge of the location of these wells for almost two years (and more than 3 years in the case of one facility)? (ALA00292)

## **XV. GROUNDWATER RISK MODELING**

### **I. Characterization of Source Term (TCLP versus Porewater)**

An industry commenter stated that EPA may have used defective concentration distributions (i.e., uniform or normal distributions) in their Monte Carlo simulations resulting in too many high-end concentration runs. Several industry commenters also questioned whether the specific analyses (e.g., porewater data) used were appropriately representative of leachate from waste management units. One of the commenters suggested that vacuum drawn pore water samples will almost always overpredict the concentration that will be exchanging out of a source layer of ash and into a productive aquifer system. One of the commenters was concerned that the Agency interchangeably used data from porewaters, TCLP results, SPLP results, and data for FBC waste and mixed waste. The commenter also stated that non-standard leachate procedures (i.e., 2:1 water extracts) were mixed with the data. This commenter also was concerned that the source term did not consider the alkalinity of FBC waste.

Public interest group commenters also questioned the adequacy of porewater data to represent surface impoundment leachate and TCLP data to represent landfills. One of the commenters stated that, based on comparison with pore water data, TCLP data consistently fail to predict the actual concentration of contaminants available for migration into ground water. The commenter also expressed concern that EPA could not vouch for the representativeness of the TCLP data on a facility-specific basis. Another commenter questioned the change from porewater data to represent landfills in the draft risk assessment to TCLP data for landfills in the sensitivity analysis. This commenter also was concerned that the assessment did not consider waste effluents such as sluice wastes and low-volume wastes. The commenter further expressed concern that no distinction was drawn between filtered and unfiltered samples.

Response: In the assessments performed for the October 1998 analyses, EPA did in fact use lognormal distributions of the site-averaged waste leachate concentrations in all of the Monte Carlo assessments presented.<sup>39</sup> Thus, in its Monte Carlo assessments EPA used the type of distribution recommended by the commenter.

While responding to specific comments below, EPA notes that it used all the data made available and in accordance with its best judgement knowing the advantages and disadvantages of data collected by varying means.

EPA believes that, given the constraints imposed by available data, it appropriately used specific analyses to represent the appropriate wastes and management scenarios. For example, for comanaged wastes, EPA believes its use of porewater and TCLP analyses was appropriate to represent surface impoundments and landfills, respectively. Each of these tests were performed to

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<sup>39</sup> FF2P-S0361, Attachment 2 (Monte Carlo Results).

simulate different leaching environments. Specifically, the porewater data were collected principally from surface impoundments, and, therefore, these data were used in the surface impoundment scenarios as the best available representation of leachate from these units.

In its June 1998 report, EPA used the porewater data for its landfill assessment but acknowledged that the resulting analysis was expected to be very conservative.<sup>40</sup> One reason for this is that the porewater data driving the analysis were collected from impoundments with standing water and high infiltration, a situation different than a landfill with relatively little free liquid. The TCLP is intended to simulate leaching in a particular landfill environment. While neither the impoundment porewater data nor the TCLP data may perfectly reflect the conditions in a comanaged landfill, EPA expects that the TCLP data better reflect these conditions. The Agency, therefore, revised its analysis for landfills to use TCLP data and presented these revised results in the October analyses.<sup>41</sup>

EPA acknowledges that the TCLP data collected from each facility may not be representative of the conditions at the site but disagrees that the collected data are necessarily over- or under-predicting the site conditions. These data were collected from a portion of the samples collected at the site; typically between 2 and 4 were analyzed for TCLP. These samples were collected from different cores throughout the site. EPA did not identify any particular bias in the selection of samples analyzed for TCLP.

EPA also disagrees with the comments that leaching test results were improperly interchanged. The specific test results used for the comanaged waste scenarios and EPA's logic in selecting them are described above. In the case of the modeling of FBC wastes, EPA used data specific to FBC wastes using only the TCLP and EP leaching procedures.<sup>42</sup> Similarly, in modeling OCWs, EPA used TCLP and EP data specific to OCWs. While EPA acknowledges that the TCLP and EP tests represent two different leaching procedures, they are similar in that both use organic acids as extraction media. EPA did not have available any data representing FBC waste or OCW pore fluids; it also did not combine the TCLP/EP data with SPLP data.

EPA disagrees that low-volume and sluice wastes should have been considered in its assessment. EPA's study for this determination was of large-volume wastes comanaged with low-volume wastes, and, therefore, EPA used data that represent these comanagement scenarios. Low-volume wastes and sluice waters managed alone are outside the scope of this determination.

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<sup>40</sup> FF2P-S0363, Section 7.1.

<sup>41</sup> FF2P-S0361.

<sup>42</sup> FF2P-S0363, Section 3.3.2. The data were recalculated in the October report (FF2P-S0361, Attachment 1) with no difference in the types of data included (i.e., TCLP and EP data were used in both instances).

With regard to its evaluation of filtered and unfiltered data, EPA attempted to consistently use the same type of data in its analyses (i.e., filtered). However, at some sites with comanagement data, only unfiltered data were available (or the type of analyses was not specified). In these cases, EPA elected to use the data available because the remaining alternative would be to disregard the data or evaluate it separately. To maximize the use of all its data and develop relevant statistical parameters, EPA elected to combine these types of analyses.

In sum, EPA made every effort to use the only data it had in a balanced, representative, and consistent manner, while minimizing known data deficiencies.

**XV. GROUNDWATER RISK MODELING**  
**I. Characterization of Source Term (TCLP versus Porewater)**  
**Verbatim Commenter Statements**

Data from different leachants with different metal chelating properties are mixed inappropriately. (ARIPPA00019)

The reference data used for the leachate concentrations are also questionable. It is reported that EPA's data can be pore fluids, TCLP leachate data or SPLP leachate data, or the numbers may be derived from FBC wastes or mixed wastes. In one instance, the attempts to recover samples from cores drilled into a fly ash pile did not produce any liquids, a typical condition for engineered minefill fly ash placements. However, in order to report some numbers for the site, the ash was mixed 2:1 with water and leached to produce a liquid sample. [The Ground-Water Pathway Human Health Risk Assessment, p7-3, 1998]. These data are derived from a non-standard leach procedure, which is uncontrolled and hence the data should not be utilized. In the modeling activities, these various leachates have been used interchangeable when in fact the nature of the different leachants is radically different and results in different amounts of metals in solution. Organic acids will tend to chelate certain metals and hold them in solution giving artificially inflated solubilities. (ARIPPA00019)

To summarize our concerns with the Source term of the EPA's model, we believe that the model is flawed because...The alkalinity of the FBC ash was not considered. (ARIPPA00019)

Non standard leachate procedures were used to collect a portion of the data and the data from these tests was mixed with standard test data. (ARIPPA00019)

The data used for input concentrations may have been misinterpreted allowing extreme values to be used inappropriately in the model. This is a critical issue because, according to EPA's Report to Congress, the source concentration is the most sensitive parameter in the whole model for controlling outcome. As one who has personally run laboratory analysis on coal combustion products for years I have found that solid to liquid ratio has a profound influence on leachate concentration for most trace elements ... I have grave concerns with the way pore water samples were used in the impoundment case. EPA averaged the concentration down the length of the entire sample (and indeed the sample values over the entire site) ... Much of the data in the data base was apparently vacuum drawn pore water samples, but these values were averaged and used as if they were samples drawn up and down the length of an as used aquifer unit. Remember that vacuum drawn pore water samples do not represent flowing and exchanging water moving through an aquifer unit ... vacuum drawn pore water samples will almost always over-predict badly the concentration that will be exchanging out of a source layer of ash and into a productive aquifer system ... The problem is that the sample was averaged and treated like a sample across a

productive aquifer when it was not. The results of the deterministic analysis are completely invalid as a result. (NMA00024A)

EPA used defective concentration distributions in their Monte Carlo simulations resulting in too many high end concentration runs. Obviously this problem will cause the Monte Carlo runs to overpredict risk. From what is written in the risk assessment report of Oct. 1998 and the Report to Congress the problem would be a catastrophe, because these reports talk about taking a midpoint central tendency value plus or minus 50% with parameters having a similar role to concentration. This would cause many readers, including myself, to assume that a uniform distribution or maybe on a good day a normal distribution had been used. I understand from conversations with EPA personnel and their contractor following the hearing on May 21, 1999 that a lognormal distribution of source concentrations was used. If this action was taken and simply omitted from the report, the agency avoided compounding an already critical problem. High concentration values are far more scarce in lognormal distributions than in uniform or normal distributions and running the Monte Carlo simulation with the number of high concentration cases way off from reality would be a fatal flaw. (NMA00024A)

A good indication of the weakness of the TCLP for the wastes in question can be found in Table 3-9 of the Report to Congress. In this table, EPA provides TCLP data (covering wastes in both landfills and surface impoundments) and pore water sample data (covering surface impoundments) for co-managed coal combustion wastes. For every toxic contaminant but mercury, both the mean and upper range of the pore water data exceed the TCLP data, typically by an order of magnitude or more. In the case of arsenic wastes, a particularly important contaminant in coal combustion the difference between the mean pore water and TCLP data is almost two orders of magnitude. Insofar as the pore water data represent "actual leachate" results for surface impoundments, it is clear that the TCLP data consistently fail to predict the actual concentration of contaminants available for migration into groundwater. (EDF00021)

EPA also cannot vouch for the representativeness of the TCLP data on a facility-specific basis, therefore the Agency hasn't a clue what it is combining to achieve a so-called "average" result. The term itself is misleading in this regard. Averaging non-representative data for a facility does not magically yield a representative facility average. (EDF00021)

In the groundwater risk assessment, concentrations may not be reflective of actual conditions due to the tests used. Specifically, the tests used to estimate the extent to which the metals leach from the waste may be inadequate. EPA has not demonstrated that the leachate tests (Toxicity Characteristic Leaching Procedure, TCLP) for landfills and leachate represented by pore water samples for impoundments is adequate for risk assessment. (ALA00036)

EPA replaced the pore water samples used in the April 1998 groundwater risk assessment with TCLP data. The use of TCLP data resulted in a significant decrease in the concentration of



toxicologically significant metals and a decrease in the risk estimates to levels above one-in-ten thousand for cancer risks and below a HQ of 1 for non-cancer risks (see table below). EPA does not explain this significant change in the groundwater risk assessment, which occurred after the peer review in the Report. (ALA00036)

Data from pond waters from comanaged coal waste also did not include waste effluents — such as sluice wastes and low volume wastes. These were not considered because it was believed that these wastes represent only localized effects. It should be noted, however, that these aqueous wastes have the potential to be transported off-site. In addition, although most of the samples were filtered, some were not and no distinction was between these two sampling methods in the data compilation. (ALA00036)

We requested clarification of the waste characterization data in the Report to Congress during the public comment period. EPA responded through their contractor, SAIC, on June 25, 1990. SAIC indicated that the porewater data used in the June 1998 draft version of the ground water risk assessment was changed to the Toxicity Characteristic Leaching Procedure (TCLP) data in the October 1998 final risk assessment. This highly unusual exchange of analytical results after the risk assessment was completed and peer reviewed resulted in substantial understatement of the risks associated with leaching of FFC waste constituents from a hypothetical landfill to a drinking water source. Although EPA justifies this change because only 3 landfills of a known population of 500 were included in the site investigations, the use of TCLP data appears equally problematic ... In addition, this major change is not adequately explained in the technical background document and simply not mentioned in the Report to Congress. Since this change occurred after the risk assessment was peer reviewed EPA should, at a minimum, explain their rationale and discuss the uncertainties associated with the use of TCLP data in the ground water risk assessment. (ALA00292)

## **XV. GROUNDWATER RISK MODELING**

### **J. Fixed Exposure Assumptions**

Some public interest group commenters expressed concern that the exposure parameters are based on central tendency values for such factors as ingestion rates, and residence time and, therefore, do not account for above-average exposures. One of the commenters suggested EPA use 90<sup>th</sup> percentile values for exposure factors. The commenter also specifically stated that the exposure duration for elderly residents may be far longer than 9 years.

Response: The commenter correctly notes that exposure duration is dependent on age. In EPA's Exposure Factors Handbook,<sup>43</sup> EPA compiles various studies regarding population mobility and concluded that a 9 year residence time is representative of the 50<sup>th</sup> percentile from the studies. One of these studies<sup>44</sup> presented residence time by age, showing that the elderly population (age 63 to 84) had a median residence time of 19 years or more, while a 33 year old had a median residence time of 9 years (i.e., the residence time used in the risk assessment). All such data are taken directly from the Exposure Factors Handbook.

EPA's Office of Solid Waste includes above-average exposures as a part of its risk analyses. EPA did so in this case. As part of its deterministic high-end analysis, EPA conducted a sensitivity analysis seeking those parameters most affecting exposure to ground water. EPA found that setting two parameters to their high-end values (leachate concentration and well location) resulted in the case of highest double high-end risk. EPA did not set additional parameters, such as length of exposure, to their high-end values (e.g., 90<sup>th</sup> percentile exposure duration or a duration more appropriate to elderly subpopulations) because the end result would have been an overly conservative (i.e., multiple high-end, instead of double high-end) analysis. Again, this is a matter of EPA Office of Solid Waste policy and is not unique to this study.

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<sup>43</sup> *Exposure Factors Handbook, Draft. Volume I - General Factors*. EPA, Office of Research and Development. April, 1996.

<sup>44</sup> Johnson, T. and Capel, J. A Monte Carlo Approach to Simulating Residential Occupancy Periods and its Application to the General U.S. Population. EPA, Office of Air Quality and Standards. 1992.

## **XV. GROUNDWATER RISK MODELING**

### **J. Fixed Exposure Assumptions**

#### **Verbatim Commenter Statements**

Because the concentrations of chemicals in FFC waste are suspect, the exposure estimates are also suspect. As a result, the analysis could underestimate risks, especially to populations with above average exposures. (ALA00036)

The exposure parameters are based on central tendency values for such factors as ingestion rates, and residence time and, therefore, do not account for above-average exposures. In the groundwater risk assessment, EPA assumed that drinking water exposure would occur for only nine years (residence time) and at an ingestion rate of 1.4 liters per day. These are average exposure factors and do not protect people who, for examples, live in their homes throughout their childhood and high school years and drink more than one and one half liters of water per day. (ALA00036)

EPA is required to assess the risks associated with highly exposed subgroups. "This descriptor is useful when there is (or is expected to be) a subgroup experiencing significantly different exposures or doses from that of the large population. These subgroups may be identified by age, sex, lifestyle, economic factors. or other demographic variables." (EPA. 1995) ... the reasonable maximum exposure concentration is determined by setting the exposure frequency and duration at the 90th percentile concentration ... Based on a comparison of the values used by EPA in the ground water risk assessment and the values representing the 90th percentile for the U.S. population, it is apparent that EPA has not evaluated the high-end reasonable exposures. (ALA00292)

These facility-specific maps illustrate that there are real people living near power plant FFC waste facilities, not just "hypothetical receptors". Included in these populations are children, who are a more sensitive subpopulation and the elderly whose duration of exposure may be far longer than the 9 years estimated for the "high-end" groundwater exposure. (ALA00292)

Some of the drinking water risk assessment assumptions seem to be inadequate-for example, the assumption that an adult resides in a home and is exposed to contaminated groundwater for only 9 years and drinks only 1.4 liters of water per day. What about the adult who lives in the same home for 18 years and consumes twice that amount of water-a completely reasonable assumption? (49CAO00058)

## **XV. GROUNDWATER RISK MODELING**

### **K. Other Input Assumptions Fixed**

Industry and academic commenters stated that modeling did not account for all the variable geologic conditions or site-specific situations possible. One of these commenters specifically noted that the model is not capable of evaluating landfills in downgradient areas, or landfilling below the water table (a common practice on the Texas Gulf Coast)

A public interest commenter argued that EPA has not taken into account variable conditions that exist throughout the U.S. regarding proximity to receptor well, unit liner characteristics and infiltration rate, meteorological and hydrogeological settings, unit size and waste characteristics. Specifically, the commenter was concerned about not accounting for karst terrain or sensitive environments such as wetlands. This commenter also was concerned that EPA did not vary waste characteristics to reflect variability in feed and operating conditions over time.

Response: EPA notes that downgradient and below-watertable fill may be minefilling; the commenter was not clear on this. EPA does agree that current modeling does not address this problem well. Section VII of these comments and responses discusses minefilling and EPA's planned action. We will address site specific below-watertable landfilling issues in the same manner.

EPA agrees that the EPACMTP modeling does not address several of the site or regionally specific variable geologic conditions noted by the commenters. As is well known, this is not a comment unique to today's rulemaking. EPACMTP is targeted on assessing risk on a nationwide basis and EPA has previously acknowledged areas in which the modeling results are not applicable.<sup>45</sup> In any event, EPA determined not to rely on modeling in making its regulatory determination for minefilling. For other waste management scenarios, the Agency believes that its selection of typical geologic conditions was appropriate for a national level risk assessment, as noted next.

EPA disagrees with the comments that other variable conditions such as receptor well location and infiltration rate were not considered. The variability of such factors were explicitly considered in its Monte Carlo and deterministic sensitivity analyses, where values used as input parameters were allowed to vary over a plausible range. In deterministic analysis, EPA evaluated all factors adjudged to affect results most significantly.

EPA also disagrees that waste management unit sizes were consistently underestimated and that waste characteristics did not account for variable conditions. For its assessments, EPA used

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<sup>45</sup> FF2P-S0363, Section 7.

data from surveys sponsored by industry associations to estimate the size and characteristics of the waste management units. These data represented the best available for characterizing particular waste management units. EPA used the distribution of these values as inputs in its Monte Carlo analyses, including very large units. In sensitivity analysis for its deterministic analyses, EPA identified central tendency and high-end values for waste management unit size. EPA found that these parameters were not as significant as others, such as initial waste concentration.

EPA also disagrees that waste characteristics did not account for variable operating conditions. EPA used the complete distributions of site-averaged waste characteristics as inputs in its Monte Carlo analyses, thus reflecting the full range of variation represented in the available data. In its deterministic analyses, EPA used a high-end value for initial leachate concentration. The use of this value would account for higher levels of contaminant release that would occur in a small section of the population. These higher levels of release represent the high-end scenario over the range of operating conditions for which data were available.

**XV. GROUNDWATER RISK MODELING**  
**K. Other Input Assumptions Fixed**  
**Verbatim Commenter Statements**

An assumption was made that the sampling data reflect the overall population of landfill wastes and that the leachate composition is not variable. Although EPA notes that the assumptions were not tested and would be affected by variability in feed and operating conditions over time, there is no further consideration of these effects. (ALA00036)

Each management scenario was described and modeled in terms of the proximity to the nearest groundwater receptor well, unit liner characteristics and infiltration rate, the meteorological and hydrogeological settings affecting the unit, unit size and waste characteristics (discussed above). In all cases EPA has not taken into account variable conditions that exist throughout the U.S. regarding these parameters. (ALA00036)

There are concerns that the use of model parameters does not account for the variability of conditions across the U.S. For example, the different geologic characteristics of the areas where waste landfills or impoundments are located are not taken into account. Sensitive environments, such as facilities located in karst terrain, could allow contaminants to quickly and easily migrate to groundwater. Under certain circumstances, this migration may occur largely unattenuated and in an undiluted fashion. In addition, waste sites near wetlands areas may have a greater likelihood of contaminating groundwater due to the role of wetlands as groundwater recharge areas (EPA, 1995). These factors are critical to EPA's assessment because EPA dismisses significant public health risks because modeling predictions indicate that the contamination will not occur for several hundred years. Suppose the model under predicted migration? (ALA00036)

EPA used central tendency values for all the driving parameters in the risk assessments — starting waste concentration, size of unit, exposure duration, and distance to receptor. (ALA00036)

The comment at this point is that it does not appear that the modeling, in either the Deterministic or Monte Carlo case, deals with the realities of the geologic situation. I have had a little experience with review of these techniques as a Citizen member of the EPA focus group on Industrial Non-hazardous Waste Guidance, and it certainly appears that there is opportunity to add geologic reality to at least some of the modeling. The response to this comment may be that this is built into the models. I would not agree. (RICE00041)

The study did not evaluate several situations that are typical in the Texas Gulf Coast lignite area. One was minefilling - because it is difficult to evaluate because of the interference by the backfilling operation. The same could be said for landfills in areas subsequently backfilled on the downdip or downgradient side. Another admitted shortcoming was the present inability to model the results of landfilling below the water table - which SAI [Revised Sensitivity Study] regretted.

But again, this landfilling below the water table operation is common in the Gulf Coast, for both municipal and coal mine landfills. Most of the lignite mines dewater the associated sands by wellpointing long before mining begins. That is, groundwater has a significant involvement in the Gulf Coast region where the study failed to deal with at least two very real situations. (RICE00041)

The comment is that the tentative conclusions fail to consider basic real situations in the Gulf Coast region that involves a significant number of coal waste disposal situations. (RICE00041)

## **XV. GROUNDWATER RISK MODELING**

### **L. Specific Technical Comments on Model Design**

As noted under Topic XV.A, a public interest group commenter provided a detailed technical report addressing issues related to the ground-water model (EPACMTP). These comments were directed primarily at MINTEQA2, the metals partitioning input component of CMTP, but many comments affect the overall model (EPACMTP) itself. An industry commenter stated that it shares some of EDF's general concerns with EPA's utilization of CMTP beyond its capabilities, and supports a thorough review of MINTEQA2. The industry commenter argued, however, that the specific modifications suggested by EDF commenters are unrealistic.

This industry commenter also cautioned that the specific risk results presented in the EDF report were based on unrealistic input concentrations, and are, therefore, designed to produce extreme results to draw attention to deficiencies in EPA's approach. The contractor that prepared the report for EDF clarified that the report was intended to be a general review and critique of the model the Agency is using in a broad spectrum of regulatory determinations.

EDF's comments were summarized in two tables for delivery to EPA. For ease of presentation and general review, these are compiled into the several points summarized below where both industry response and the status of EPA's review is noted.

General Response: EPA is carefully reviewing all of these very specific comments on the model. The process of thoroughly investigating all of the comments will take substantially more time to complete than is available within the court deadline for issuing this regulatory determination. At this time, we are uncertain of the overall outcome of our analysis of the issues raised in the comments. Accordingly, we are not relying on the results of our ground water pathway risk analysis in support of today's regulatory determination on fossil fuel combustion wastes. In making today's regulatory determination, we have relied on other information related to the potential danger that may result from the management of fossil fuel combustion wastes.

Because all of these comments are the subject of the thorough, long term analysis cited several times throughout this section, it is premature to attempt responses to each individual comment at this time. Therefore, we have not attempted to respond to these points for today's rulemaking.

At this time, we have not determined what, if any, changes are appropriate to make to the model. However, the conclusions of our analyses may involve changing or re-structuring various aspects of the model, if appropriate. It may also include additional analyses to determine whether any changes to the model or modeling methodology would materially affect the groundwater risk analysis results that were reported in the RTC. If our investigations reveal that a re-analysis of groundwater risks is appropriate, we will conduct the analysis and re-evaluate today's decisions as warranted by the reanalysis.



In addition to our ongoing review of comments on the overall groundwater model, one element of the model – the metals partitioning component called "MINTEQ" – has been proposed for review by EPA's Science Advisory Board (SAB). We will take the findings of this review into account in any overall decision to re-evaluate today's regulatory determination.

In response to the industry commenter, EPA is aware that the results presented in EDF's analysis are the results of a theoretical exercise designed to call attention to issues with the model and do not duplicate or replace the analysis conducted for the FFC risk assessment. Specific concerns with the suggested modifications raised by the industry commenter are included in the numbered items below. Specific FFC chemical contaminations were not used in this critique, despite the industry commenter stating to the contrary.

Below are listed the specific comments as submitted by EDF, the initial comment in response by industry commenters and the status of EPA's review. As noted, EPA's analysis of these comments is underway and it would be very premature to offer judgments as to how these might impact on risk modeling. EPA believes certain comments to have merit, but the collective effect remains to be studied. As noted elsewhere in this response, this will take far more time than was available under this court schedule, and, if warranted, groundwater risk modeling will be revisited.

Comments in EDF table entitled "Summary of MINTEQA2 Critique and Improvements to Isotherm Generation Method"

- Flawed Chemistry of the Basic Ground Water - EDF raised concerns with regard to ion charge imbalance in ground water, to improper geochemical relationships in the STORET data base, to the presence of exclusively oxidized elements (carbon, sulfur, iron, nitrogen), to mineral phase disequilibrium, to low input concentrations for calcium, magnesium, phosphorous and sulfur, and relative to ignoring of colloidal phase iron and aluminum. USWAG disagreed with EDF's concerns about colloidal transport and EDF's interpretation of the STORET data. EPA's study of these interrelated issues is underway. (These are items 1-7 in the EDF critique.)

- Leachate Chemistry - EDF raised concerns that leachate chemistry was not considered in isotherm calculations, that other contaminants may be present in leachate, and that leachate pH may overwhelm an aquifer. USWAG disagreed with the potential for leachate pH to overwhelm aquifer pH. EPA is just beginning to study these. (These are items 8-10 of the EDF critique.)

EPA is just beginning to address the following comments.

- USEPA Master Variables - EDF raised concerns that arbitrary pH cutoff values are used, that high pH isotherms are missing, that inappropriate surface area and concentration range for iron substrate are used, that LOM appears to have a low impact on Kds, that POM/DOM sorption

capacity is overestimated, that inappropriate charge balances are used for POM species, and that there are other problems with the POM variable. USWAG argued that the suggested changes to iron oxide surface area are not scientifically justifiable. (These are items 11-18 of the EDF critique)

- Calculation Errors - EDF identified two alleged calculation errors: treatment of particulate organic substrate and miscalculation of saturated zone Kd for lead. (These are items 19 and 20 of the EDF critique.)

Comments in EDF table entitled "Supplemental Critique of CMTP Metals Modeling"

There were five of these, all not yet addressed by EPA:

- (1) Shaky Assumptions - EDF raised concerns that model geochemistry is not related to local waste units, soil water partitioning is linear in the saturated zone.
- (2) Unreasonable Program Requirements - EDF raised concerns about inappropriate Kd for saturated zone, monotonic isotherms, and inappropriate selection of isotherms.
- (3) Implementation Errors - EDF noted that EPACMTP master variable values do not always map against MINTEQA2 values.
- (4) Counter-Intuitive Input - EDF raised concerns about the selection of very limited number of FFC isotherms from wide range possible, questionable FFC infiltration rate, and questionable FFC median model inputs for Monte Carlo runs.
- (5) Inadequate or Confusing Output - EDF raised concerns about negative time to peak values, inadequate calculation of times to peak vs HBN concentrations, steady state vs. transient concentration measurement.

In sum, EPA notes that these comments taken as a whole are substantive and need study. Many are related in that they depend on ensuring proper ion balance, and many relate to well known issues of national vs. site specific rulemaking. All are under investigation.

**XV. GROUNDWATER RISK MODELING**  
**L. Specific Comments on Model Design**  
**Verbatim Commenter Statements**

As the enclosed report entitled Use of MINTEQA2 and EPACMTP to Estimate Groundwater Pathway Risks from the Land Disposal of Metal-Bearing Wastes indicates, the Agency's use of MINTEQA2 to generate the sorption isotherms systematically understates the potential for metals contaminant migration, often by many orders of magnitude. The report documents 20 important technical errors built into EPA's use of the model related to the chemistry of the groundwater assumed in MINTEQA2, the effect of waste leachate chemistry on the groundwater, and the application of the model to generate the sorption isotherms. Addressing just four of these errors resulted in vastly different modeling results, in terms of receptor well concentrations and resulting risks, and the time of travel required wells for the contaminants to reach the receptor. These differences were observed for both the coal combustion waste and HWIR waste management scenarios modeled. (EDF00021)

Lead is the most frequently detected groundwater contaminant in the Scoping Study, but it is one for which the Agency's modeling methodology is a particularly poor risk predictor. EPA's modeling produces extremely steep Dilution and Attenuation Factor (DAF) curves for lead, particularly for leachate concentrations below 1 ppm, and thus extraordinarily high DAFs result for most modeling runs. In contrast, the alternative isotherms produced by the authors of the enclosed report, after correcting only four of the 20 errors, produced much flatter DAF curves, particularly for the lower leachate concentrations. (EDF00021)

USWAG and EPRI have reviewed Norris & Hubbard's work. While we share some of the authors' general concerns with EPA's utilization of CMTP beyond its capabilities, and support a thorough review of MINTEQA2, we believe it is imperative for EPA to recognize that the specific modifications Norris & Hubbard suggest are unrealistic. Their work is a theoretical modeling exercise, designed to produce extreme results to draw attention to deficiencies in EPA's approach. (USWAG00275)

In general, the extreme difference between EPA's modeling results and those obtained by Norris & Hubbard is due largely to differences in the input data. There are three major sources of error in Norris & Hubbard's modeling that led to vast overestimates of groundwater concentrations for cadmium, lead, and mercury: (1) the leachate concentration ranges; (2) iron oxide adsorption surface area; and (3) facilitated transport via iron oxide colloids. Furthermore, Norris & Hubbard performed no validation of their modeling. In addition, Norris & Hubbard's claim that EPA's model under-predicts the effect of high pH is unsupportable. (USWAG00275)

Noms & Hubbard modeled the fate and transport of three metals - lead, cadmium, and mercury - using input leachate concentrations that are orders of magnitude higher than observed data can

support ... It is clear from these plots that the input concentrations used by Norris & Hubbard are not representative of leachate concentrations at FFC co-management sites ... Not only did the authors select arbitrarily high leachate input concentrations, but they then chose only the upper 90th percentile of the Monte Carlo results. Their results thus focus on the upper end of an exaggerated, conservative modeling exercise. (USWAG00275)

Norris & Hubbard acknowledge that iron oxide surface area available for adsorption is a key parameter influencing attenuation of metals. However, the authors provide no reference or justification for decreasing the value of this sensitive parameter by more than four orders of magnitude, from 600 m<sup>2</sup>/g to 0.038 m<sup>2</sup>/g. Such manipulation has a significant effect on modeling results and is unreasonable. Research supports values for iron oxide surface area and adsorption site density at least as large as those used by EPA. For example, for iron hydroxide, Davis and Leckie report a surface area of 700 m<sup>2</sup>/g, and Gitvin, et al. report a surface area of 600 m<sup>2</sup>/g. Furthermore, these two references support the use of a surface density of 101 sites /m<sup>2</sup>, more than 4 times higher than that used by EPA. EPRI research determined that a clay fraction (iron hydroxide as well as non-iron clay minerals) in two soils from electric power plants had total surface areas of 118 m<sup>2</sup>/g and 160 m<sup>2</sup>/g, almost four orders of magnitude higher than the value used by Norris & Hubbard for iron hydroxide. The EPRI data also document iron concentrations of 1.3 percent to 6.4 percent in soils at five power plants. These values are significantly higher than those used by EPA and by Norris & Hubbard and demonstrate significant additional adsorption capacity is available. (USWAG00275)

In addition to substituting their own values for numerous key assumptions, Norris & Hubbard's approach differs significantly from EPA's in the use of a custom designed FORTRAN program to address facilitated transport of metals via entrained colloidal iron. The program projects transport of increased amounts of trace metals adsorbed to the surface of colloidal iron. However, there is no reliable support for the proposition that the transport of metals from FFC co-management units is enhanced by a colloidal transport phenomenon. (USWAG00275)

The authors attempt to justify their approach based on several dubious assumptions. First, Norris & Hubbard assume that the data for iron in EPA's STORET database represent filtered concentrations. However, many regulatory agencies require either unfiltered, or both filtered and unfiltered concentrations. Therefore, this assumption is likely to be invalid. Based on the first questionable assumption, the authors then made a second questionable assumption that any iron concentrations in excess of a hypothetical threshold value must represent colloidal iron. Finally, the authors assumed that this colloidal iron is entrained and travels with groundwater. The authors provide no reference for any of these assumptions. (USWAG00275)

Facilitated transport by colloids is a complex issue. While the occurrence of facilitated transport has been postulated, and descriptive models have been developed, - the role of facilitated transport is at best a point of scientific debate. Ryan and Gehwend suggest that potential colloid transport may be limited in groundwater. Roy and Dzombak suggest that colloid transport may be

significant only under very specific geochemical and hydrogeologic conditions. The state of the science is such that significantly more research, including field investigations, is necessary to describe facilitated transport before reliable models can be developed and validated for regulatory use. The data from the EPRI co-management site investigations show that colloidal transport is not a significant issue for coal combustion waste management units. At EPA's request, EPRI examined at each field investigation site the differences in constituent concentrations at two filter pore sizes, 0.007 microns and 0.45 microns. If colloidal transport were a significant mechanism at these sites, we would expect higher constituent concentrations in the samples filtered using the larger pore size. However, as the analytical results for paired samples of cadmium, lead, and iron shown in Figure 4 demonstrate, this was not the case. (USWAG00275)

Norris & Hubbard have not attempted to validate their suggested approach, despite the ready availability of field data. They compare their modeling results only to EPA's modeling results. However, the most important test for any model is validation against field data. A simple validation exercise proves Noms & Hubbard's model fails to predict real world conditions ... The authors present no evidence that their revised model provides better or more accurate results than the EPA model. In fact, groundwater data collected at co-management sites demonstrate that model predictions of widespread occurrence of high concentrations of these constituents 100 meters from the site are clearly in error. (USWAG00275)

Norris & Hubbard note that groundwater pH is the most significant factor influencing & isotherms. However, throughout the report the authors suggest that the range of pH values that EPA used was not representative of FFC waste management sites. Their argument is unpersuasive and does not support their claims that EPA has under-predicted leachate concentrations. The argument that the model should be adjusted because some coal combustion wastes have pH values of 10 or higher is simply not on point. The relevant isotherms must be calculated using groundwater pH, not waste pH. (USWAG00275)

Norris & Hubbard's additional assertion that the high pH in the waste may overwhelm the buffering capacity of the natural system, resulting in a higher groundwater pHs is unpersuasive because it fails to acknowledge real world conditions. Data from the CL co-management study site, for example, demonstrate that the high pH of the ash porewater does not persist even a few feet below the pond. Norris & Hubbard do not provide a citation to their anecdotal reference to a site in Wisconsin which they claim demonstrates that high pH persists in groundwater at co-management sites. See Norris & Hubbard at 23. Nonetheless, this conclusion defies the weight of evidence. Norris & Hubbard are probably referring to the P4 site documented in an EPRI site investigation report. The P4 site manages high pH ash from western coal. There are approximately 60 monitoring wells at the P4 site, and EPRI data indicate that leachate pH ranges from 8.3 to 12.5. Porewater samples collected from borings extended through the ash and into the underlying soil indicate a pH decrease of two to four pH units in the soil immediately below the ash. Samples from ten downgradient wells located within approximately 100 feet of the edge of the CCB had pH values ranging from 6.5 - 9.9, indicating that the high pH in the ash does not persist in

the groundwater system. Historical data demonstrate that one well at the site exhibited a pH of 12.0, similar to the leachate. This shallow well is located on the edge of the ash disposal area, and is believed to be sampling leachate from a small area that is poorly drained. The high pH conditions were not found in the intermediate or deep groundwater wells in that well nest or in other wells not in contact with the edge of management unit. (USWAG00275)

Although the topic of the greatest volume of comment in the USWAG document concerns the EPACMTP modeling review, it does not appear that USWAG understood the purpose or method of the report. USWAG's discussion seems predicated on the Norris and Hubbard report as being a fate and transport modeling exercise for CCW waste. It was not, nor was it to be. The model was not attempting to model CCW. It was evaluating the implementation of four changes to the EPACMTP program input, relative to the outcome calculated by EPACMTP as used by USEPA. (GHIL0012)

The EPACMTP report was a general review and critique of the program that has been is being used in a broad spectrum of regulatory determinations. It focused only on those applications for inorganic contaminants, because it is observed that the EPACMTP modeling results under-predict concentrations of metals relative to the observations in the real world data. (GHIL0012)

The assessment was to determine whether there were identifiable aspects of the modeling that could lead to systematic under-calculation of metals mobility in a variety of applications ... The report was not prepared as a comment document on the CCW determination and would have been submitted absent any regulatory determination on that particular waste stream. (GHIL0012)

Much of the USWAG discussion is irrelevant in the light of the actual purpose of the study. For example, USWAG objects strenuously to the three contaminant concentrations used for the comparison scenarios. These contaminant source-term concentrations were not selected to represent a particular waste stream. (GHIL0012)

Another manifestation of USWAG's failure to understand the objectives of the Norris and Hubbard report is its discussion in V.A.3. regarding the need to verify (USWAG presumably means validate, rather than verify) the results of the modeling against real world data. The model was not attempting to model CCW. It was evaluating the implementation of four changes to the EPACMTP program input, relative to the outcome calculated by EPACMTP as used by USEPA. (GHIL0012)

The element generating the least comment is the impact of high pH on the mobility of dissolved metals. Here there is no disagreement as to the chemical importance of high pH to metals mobility, only a dismissal of the concern in the field and the observation that high pHs are not characteristic of CCW sites study by EPRI. USWAG dismisses the persistence of high pH by citing data from two sites selected by EPRI for its study. The two sites appear to suggest that high pH values in CCW leachate do not persist in ground water at any significant distance away from the boundary of disposal ... One of the critical errors in USWAG's discussion is the position that it is the pH of the

ground water that is relevant, and not the pH of the leachate from the waste ... There is presumed to be an unsaturated zone separating the waste from the water table and the leachate first migrates through the unsaturated zone and then enters the underlying aquifer. The EPRI data cited in USWAG's discussion of their site P4, as well as multiple sites identified by HEC to USEPA over the last year, shows that the EPACMTP assumption that the pH of ground water in the unsaturated zone is unaffected by the pH of the waste leachate is invalid. Not only does leachate with high pH overwhelm the pH in the unsaturated zone, it can, and sometimes does, persist in the saturated zone aquifer. (GHIL0012)

Another aspect that USWAG chooses not to consider is the potential disposal scenarios that are contemplated for these wastes if current policy and deregulation continue. Whereas now these wastes are disposed above water tables, future disposal will be done in trenches that literally replace the aquifer over its full thickness with these wastes ... Under such condition, one will expect high pHs to persist considerable distances from the disposal site. (GHIL0012)

A final aspect of the difference between the scenarios considered by the EPRI studies and the new disposal practices should be considered. USWAG's comments imply that no one will be coming in contact with the disposed ash and its *in situ* leachate, only with ground water at some distance from the disposal area ... In Indiana, where wholesale dumping of this waste is being permitted, there are no restrictions whatsoever regarding the land use of disposal sites ... Under such conditions, it must be presumed that people will be exposed directly to CCW leachate and not some downgradient, attenuated plume. (GHIL0012)

One of the major issues USWAG finds with the EPACMTP study is the inclusion of enhanced mobility of metals adsorbed onto colloidal particles of iron oxyhydroxides. USWAG identifies what it perceives as three assumptive errors on the part of Norris and Hubbard that are made with "no references for any of the assumptions." The first is that the water analyses used by EPA for its modeled ground water is derived from filtered samples. The second is that iron in the analyses in excess of equilibrium concentrations is colloidal iron. The third assumption is that the colloidal iron is mobile and travels with ground water ... It is not the assumption of Norris and Hubbard that this ground water composition is appropriate for geochemical modeling, it is the understanding of those USEPA scientists most familiar with the STORET data base. Second, the concentrations selected by USEPA as representative of iron concentrations measured in analysis of the ground water are clearly in excess of equilibrium concentrations. The iron system is very well studied ... Since the iron is present at concentrations too high to be dissolved concentrations, it must be present in some other form than dissolved. The other form of iron that is chemically likely is colloidal iron. It is how iron forms when it precipitates from solution. It is the standard form of analytical iron present at concentrations higher than dissolved concentrations, whether in the laboratory or the field. Finally, the observation that the colloidal iron is mobile is also a conclusion based upon empirical evidence, not an assumption. If the colloidal iron were not entrained in the ground water and did not move with the ground water, it would not be captured in the ground water sample and would not show up in the water analyses. (GHIL0012)



The reduced surface area proposed by the Norris and Hubbard report does make a substantial difference in the ability of the iron substrate to retard the migration of metals. However, USWAG is in error in suggesting that there is no justification for the smaller [surface area of the iron substrate proposed by the Norris and Hubbard report]. In fact, the EPACMTP report provides considerable discussion of the justification ... The use of the suggested grain size is a significant departure from the USEPA input values to MINTEQA2. However, it is justified, logical and defensible. It considers only iron oxyhydroxides in aquifer materials with characteristics used by EPACMTP. (GHIL0012)

EPACMTP, as implemented by USEPA, does routinely under-predict metals concentration relative to the real world, regardless of the waste scenario being evaluated ... If the EPACMTP were even approximately predicting a realistic mobility for metals, one would expect results that are consistent with concentrations observed in unimpacted ground water due to natural sources. But, EPACMTP will not allow concentrations to build or remain at even natural levels. Instead, if one inputs natural ground water concentrations into EPACMTP, the model cleans up the ground water. (GHIL0012)

## **XVI. ABOVE GROUND RISK MODELING**

Many commenters provided input on the design of the above ground risk assessment and the specific assumptions used in its application. A number of industry and academic commenters directed their criticism specifically at the agricultural use scenario, the input values used in considering risks to children, and/or EPA's characterization of soil arsenic toxicity. Public interest group commenters expressed concerns about the consideration of volatilization pathways and cumulative exposures and questioned specific input assumptions. Specific concerns are addressed in detail below.

(The phrase "above ground" means all risk pathways other than the explicit groundwater leaching pathway. "Above ground" thus includes many disparate and yet related pathways, embodying both indirect and direct exposures, ingestion and inhalation. This set includes air emissions and depositions, runoff, erosion and agricultural use. Transport modeling for these pathways would also be relevant for ecological risk assessment.)

Response: EPA believes the design of its above ground risk assessment was appropriately protective (erring on the side of safety) and based on sound scientific principles. In general, EPA also believes the assumptions and input values it used for the above ground risk assessment were appropriate, given the specific characteristics of FFC wastes and the environmental settings of FFC facilities. Based on specific comments about the assessment of risk from agricultural use, however, EPA re-examined key assumptions for the agricultural use scenario. From this, EPA revised its estimate of risk from agricultural use of FFC waste as discussed in Section VIII, above. The responses below address concerns about the overall above ground risk assessment in more detail.

## **XVI. ABOVE GROUND RISK MODELING**

### **Verbatim Commenter Statements**

The EPA conducted a human health risk assessment for potential human health risks to soil amendments for agricultural use. The risk assessment associated with agricultural uses has many errors associated with the calculations, which include the bioavailability of arsenic in soil, the amounts of soil ingested by children, and the toxicity values used by EPA. (PG&E00023)

USWAG disputes EPA's preliminary conclusion that agricultural applications of coal combustion products may present unacceptable risks. EPA's preliminary findings are based on a seriously flawed risk assessment performed without consultation with the U.S. Department of Agriculture and without reference to the tremendous body of scientific research sponsored by Federal agencies, the states, and industry. (USWAG00037)

EPA's flawed modeling of arsenic fate and transport clouded the conclusion regarding two economically and environmentally significant beneficial uses of these materials: mine placement of CCPs and agronomic application of CCPs. (USWAG00037)

In both the groundwater and non-groundwater pathway risk assessments, EPA selected overly-conservative assumptions for numerous key parameters, compounding errors by orders of magnitude. The results of that effort show that arsenic risk potential exceeds conservative protective levels by two orders of magnitude in the worst case scenario. Those results are merely noise generated by the extremely conservative assumptions and are indefensible. (USWAG00037)

In the non-groundwater risk assessment's agricultural use scenario for the child ingestion pathway, EPA calculated an arsenic risk of  $5 \times 10^{-5}$  and concluded that "[t]he risks identified with this practice are of sufficient concern to consider whether some form of control under Subtitle C is appropriate, given the increasing trend for use of these materials as agricultural amendments." The risk assessment upon which EPA based its conclusion is seriously flawed through utilization of multiple unrealistic, overly conservative assumptions and provides no defensible foundation for a decision to pursue further regulation of this beneficial use of CCPs. (USWAG00037)

While most of EPA's conclusions were based on sound science, NSP must address certain technical oversights which resulted in EPA's preliminary conclusion that agricultural uses of coal ash could result in arsenic exposure health risks. (NSP00057)

NSP was still able to uncover several technical oversights, omissions and errors in the draft RTC which combined to overstate calculated risks for agricultural uses of coal ash by several orders of magnitude. The underlying assumptions used in this risk analysis appear to be substantially more conservative than assumptions used in previous health risk analyses performed by the EPA for

other materials. EPA must maintain a consistent, objective basis in evaluating health risks for the public; this draft RTC appears to subjectively identify risks that do not objectively exist. The EPA health risk analysis assumed questionable values for ash application rate, ash application frequency, ash arsenic concentrations, child ingestion rate, arsenic cancer slope factor & reference dose, and coal ash arsenic bioavailability, as discussed below. (NSP00057)

I am concerned that a number of science issues have been handled inappropriately in the development of an approach to regulate fossil fuel combustion wastes (FFCW), and am taking this opportunity to provide scientific comments on the Report and on the risk assessment which is the basis for the Report. These concerns include ... methods to estimate risks from arsenic and other trace elements applied to cropland in fossil fuel combustion byproducts ... recent research and interpretation of research which might affect scientific risk assessment for soil arsenic and arsenic in land-applied byproducts including FFCW. (PHS011)

Any risk assessment is only as valid as the assumptions used in the calculations of exposure and risk. The risk assessment for beneficial use of these FFCB is replete with errors regarding application rate, fate of As in soil, bioavailability of soil As, amounts of soil ingested by children, etc. (PHS011)

In conclusion, the Risk Assessment for As in land-applied FFCB is so severely flawed that it is not a valid basis for public policy. (PHS011)

The results for the EPA calculations (Table 2) show very low acceptable soil As levels ... These extremely low acceptable As levels mean either, that the most exposed individuals (pica children, in this case) are currently being exposed to cancer-causing As levels in uncontaminated, natural soils, or that there is some flaw in the EPA risk assessment calculations ... Given the uncertainties in this information, the choice of more reasonable values, as demonstrated under "Alternative Scenarios" in Table 2, results in clearly more realistic values for maximum As levels in land-applied wastes. (PHS018)

The Risk assessments are not adequate. There are several ways in which the risk assessment and exposure analyses contained in the Report are inadequate and inconsistent with Agency policy, including the following ... The most important pathway for mercury releases -- the volatilization of mercury from landfills, impoundments, coal storage piles, fly ash, and agricultural application -- apparently has not been considered at all in this Report. Indeed, it appears that the air pathway is completely ignored. (49CA00058)

We reviewed EPA's non-groundwater risk assessment, and found it to have been performed using an acceptable methodology based on current EPA guidance ... In this review, aside from a general review of methodology, particular attention was paid to the parameters identified by the sensitivity analysis as being the most important. As discussed above, the constituent concentration is by far the most important (and most uncertain) parameter. Other parameters important for the non-

groundwater analysis are waste management unit (WMU) area, exposure duration, and distance to the receptor. These are discussed below along with other specific comments on other aspects of the assessment (e.g., the lack of a mercury analysis). (ALA00292)

**XVI. ABOVE GROUND RISK MODELING**  
**A. Application Rate for Agricultural Use**

Several commenters from industry, academics, and federal agencies indicated that the risk assessment assumed an unrealistically high application rate for agricultural use.

Response: After review of the comments on application rate and frequency, it is apparent that application frequency, as presented in the RTC and the non-groundwater risk assessment technical background document,<sup>46</sup> was misunderstood. The commenters apparently presumed application frequencies of three times per year for high-end and twice per year for central tendency. The risk assessment, however, actually used application frequencies of once every 3 years for central tendency and once every 2 years for high-end. This was noted in Section VIII.

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<sup>46</sup> FF2P-S0370.

**XVI. ABOVE GROUND RISK MODELING**  
**A. Application Rate for Agricultural Use**  
**Verbatim Commenter Statements**

The risk assessment assumed a much greater application rate for fossil fuel combustion byproducts (FFCBs which includes CCPs) than would be the real case, since application rates would be determined by the soil's lime requirements. (NMA00024)

A CCP application rate in excess of a reasonable agronomic rate. The risk assessment assumed an annual CCP application rate of 10 t/ha for 100 consecutive years. Dr. Rufus Chaney of the U.S. Department of Agriculture stated that the real world rate of application is limited by the agronomic limit, which is dictated by the calcium carbonate equivalent or nutrient the CCP is applied to supply. As an example, Dr. Chaney cited the application of 5-10 t/ha FGD material once every 3-5 years to raise soil pH for alfalfa cultivation. Application as a fertilizer for boron, sulfate or selenium content would dictate an even lower agronomic rate. Dr. William Miller of the University of Georgia stated that the risk assessment should have assumed a central tendency value of 0.5 t/ha/y and a high end value of 1.2 t/ha/year. (USWAG00037)

Table 4.1 of the "Draft Final Report: Non-Groundwater Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2," dated June 5, 1998 identified the input values for Agricultural Liming Practice Parameters, including Central Tendency and high end values for applications rate and application frequency. The central tendency values were specified at 3 tons/acre/application, with an application frequency of every 1/3 year. The high end values were specified at 5 tons/acre/application, with an application frequency of every 1/2 year. This would correspond to 9-10 ton acre/year over the assumed period of 100 years active use. These values defy any definition of agronomic requirements which must be considered when using liming materials, including coal ash, for agricultural purposes. In the State of Minnesota, there are approximately 29 million acres of farmland in production. In 1991, about 1,000,000 tons of liming materials were applied to Minnesota soils. Not all soils or crops require liming. A typical aglime application rate and frequency for soils and crops that need liming is about 2 - 5 tons, once every three to five years. (NSP00057)

When FFCB are used beneficially as soil amendments to satisfy fertilizer or limestone needs of crop production systems, the rate of application will be limited by the Ca carbonate equivalent or nutrient the FFCW is applied to supply. The rate of application assumed in the Risk Assessment is inappropriate. The Risk assessment is based on 5 t/ha, twice yearly. But the limestone value of such a product is applied to replace the amount of neutralizing value required for the field being treated. One example for use is the application to raise soil pH before one plants alfalfa, a crop which requires near neutral pH at planting to give economic production for 3-5 years of the perennial crop. Application of 5-10 t FGD-byproduct would raise soil pH to 6.5-7, based on a

lime requirement soil test, and no further application would occur for 3-5 years. Use at fertilizer rates for B, sulfate or Se would require even lower application rates, but those could be done more frequently. The assumption about application rate drives the risk assessment over time. It is certainly appropriate to consider a 100 year application period, and even the 40 year post-application period in such modeling, but the cumulative rate during that period would be much lower than assumed by EPA. (PHS011)

The application rates used by RTI (Table 4-1, RTI report) were 3 t/a once every 3 y (average annual, 1 t/a/y) as the central tendency, and 5 t/a once every 2 years (2.5 t/a/y) as the 95<sup>th</sup> percentile. Justification of these values was not given in the RTI report, but are in the author's opinions excessive. (PHS018)

A more reasonable approach is to observe that in Georgia in 1985, approximately 900,000 tons of liming materials were applied to 4.8 million acres of cropland, giving an average application rate of 0.2 t/a/y (Georgia Dept. of Agric., 1985). Georgia soils are less buffered than other U.S. soils, but are generally quite acidic, and this rate of lime application is likely to represent average conditions across the country. Using a 2.5 multiplier to arbitrarily set the 95<sup>th</sup> percentile, we would propose 0.2 t/a/y as a central tendency and 0.5 t/a/y as a high end scenario for ag lime application. Commerical lime typically has a neutralizing value of roughly 90% that of pure  $\text{CaCO}_3$  (calcium carbonate equivalence, CCE). FBC waste has a median CCE of 60%, ranging from 30% to 100% (Stout, et al, date unknown). Thus, FBC would need to be applied at a higher rate than ag lime, using the multiplier (90/CCE of FBC) in order to account for the lower liming effectiveness of FBC. The resulting matrix of lime application rates and CCE values (Table 1) shows that the central tendency case requires 0.3 t/a/y of FBC, the single high-end cases requires 0.6 to 0.75 t/a/y, while the double high-end case requires 1.5 t/a/y.



## **XVI. ABOVE GROUND RISK MODELING**

### **B. Soil Arsenic Toxicity**

Several industry commenters stated that this risk assessment did not appropriately account for the unique aspects of evaluating exposures to arsenic in soil. The commenters stated that the assessment unrealistically assumed that 100 percent of arsenic is bioavailable, even though land-applied arsenic becomes much less phytoavailable over time, and that soil arsenic in terrestrial food chains is not biomagnified. One of the commenters additionally stated that, because of differences in chemical form, bioavailability, and excretion kinetics, arsenic toxicity in soil should be lower than arsenic toxicity in drinking water. A public interest group commenter, on the other hand, stated that, while, the bioavailability of arsenic may be as low as 10 percent, it has been reported to be as high as 52 percent under certain environmental conditions.

Response: EPA agrees that it is unlikely that 100 percent of arsenic in soil is available for plant uptake and that arsenic does not biomagnify in the terrestrial food chain. Modeling did not predict the biomagnification of arsenic in beef and milk (i.e. concentrations of arsenic did not increase from soil to plants and into cattle). Soil-to-plant uptake factors as given in the table below, based on empirical studies, were used in the risk assessment to account for reductions in plant uptake. The fertilizers analysis referenced in this table accounted for the interaction among multiple soil parameters by using a distribution of measured values collected from the literature for soil-plant uptake factors. The distributions reflect actual agricultural soil conditions in multiple locations across the country.

Values were computed from the distribution of the various plant-soil uptake factors for the fertilizers project and compared to the plant-soil uptake factors that were used in FFC. Presented in the last column of the table are the values within which the FFC point estimates fall. As can be seen, all FFC values fall between the 40 and 65<sup>th</sup> percentile values that were presented in the fertilizers project. It was therefore concluded that the values that were used for FFC are representative of typical soil-plant uptake factors at the national level and appropriate for the FFC risk assessment.

### Soil to Plant Uptake

	Units	FFC Value	Fertilizer Uptake Factor Percentile Values
Leafy Vegetables	(: g/g DW plant) / (: g/g soil)	3.6E-02	45 <sup>th</sup> 3.36E-02 50 <sup>th</sup> 3.96E-02
Root Vegetables (RCF)	(: g/g WW plant) / (: g/mL soil water)	8.0E-03	60 <sup>th</sup> 7.09E-03 65 <sup>th</sup> 9.20E-03
Forage	(: g/g DW plant) / (: g/g soil)	6.0E-02	40 <sup>th</sup> 5.58E-02 45 <sup>th</sup> 6.12E-02

EPA agrees that the biogeochemistry of arsenic is complex and that one species will not predominate under all environmental conditions. Generally, arsenic(+5) is the predominant species in well-oxidized environmental systems, and arsenic(+3) occurs predominantly in reduced environmental systems. However, because the redox transformation is slow, both arsenic(+5) and arsenic(+3) may be present in either system. Ideally, both species should be considered in risk analyses. However, FFC data did not provide data for individual arsenic species. Therefore, in order to assess the risk posed by arsenic in the environment, one species must be assumed to be present in the system. It was assumed that the total arsenic concentration was present as arsenic(+3) for purposes of this risk analysis. This assumption yields the most protective results because arsenic(+3) is the more toxic and generally the more mobile of the two forms. Despite the development of pharmacokinetic models that simulate the absorption, distribution, metabolism and excretion of various forms of arsenic, study data are still insufficient to quantify relationships between arsenic in soil and arsenic in drinking water.

The Office of Water currently is reviewing the drinking water standard based on recent recommendations from the National Research Council (NRC). The NRC concluded that the drinking water standard for arsenic should be more stringent based on new information on arsenic exposure and cancer. It also suggested, without specifying a revised slope factor, that the existing slope factor should be revised. The cancer slope factor listed in IRIS considered only skin tumors while new data indicate that other tumors also should be considered. EPA is scheduled to promulgate a new arsenic drinking water standard in January 2001. Until the arsenic drinking water evaluation is completed, the current health benchmarks listed in IRIS will be used. However, it appears at this writing that arsenic standards will be revised to be more protective.

### **XVI. ABOVE GROUND RISK MODELING**

#### **B. Soil Arsenic Toxicity (Bioavailability, etc.)**

#### **Verbatim Commenter Statements**

This health risk assessment did not take into account the unique aspects of evaluating exposures to arsenic in soil. For example, risks from incidental ingestion of arsenic in soil were based on toxicity factors derived from studies of arsenic (soluble arsenate or arsenite) in drinking water (IRIS, 1999). The toxicity of arsenic in drinking water should not be directly extrapolated to the toxicity of soil arsenic because of differences in chemical form, bioavailability, and excretion kinetics (Valberg et al, Freeman et al). Based on these differences between soil arsenic and water arsenic, risks from arsenic in soil should be lower than what are calculated using default USEPA toxicity values for arsenic in drinking water. (PG&E00023)

The risk assessment assumed a much higher level of availability for soil arsenic being transferred to plants. "This assessment failed to consider that As [arsenic] in land-applied [FFCBs] becomes less phytoavailable over time. (NMA00024)

The risk assessment did not consider the fact that soil arsenic in terrestrial food chains is not biomagnified, an important factor in considering risk from trace elements. (NMA00024)

While EPA has established a maximum pollutant concentration of 41 mg/kg for arsenic in sewage sludge that is applied to land (40 CFR 503.13(b)(3)), based on an assumption that children were directly ingesting the material from fertilizer and soil conditioners available for home use. Had this limit been adjusted to reflect actual arsenic bioavailability, the limit would have been 93mg/kg. (NMA00024)

EPA failed to consider the speciation and availability of arsenic. Without discussion or justification, EPA assumed that 100% of arsenic is bioavailable. However, scientific research has demonstrated that arsenic in soils is only 10% bioavailable to mammals. (USWAG000037)

The non-groundwater risk assessment assumes that arsenic in land-applied CCPs is 100% bioavailable. However, this assumption is contrary to the body of scientific research that demonstrates that arsenic in soils is only 10% bioavailable to mammals. This error alone results in overestimation of risk by a factor of 10. In addition, the risk assessment ignores the widely accepted research that demonstrates that arsenic in land-applied CCPs becomes less phytoavailable over time and that plant absorbed arsenic is not biomagnified in higher trophic levels. (USWAG000037)

The draft RTC health risk analysis assumed 100% bioavailability of arsenic in coal ash. Dr. Chaney of the USDA testified at the EPA Public Hearing on May 21, 1999, that numerous studies demonstrate that only 10% of arsenic in coal ash would be bioavailable. (NSP00057)

One of the pathways evaluated was the plant absorption of As and harm to consumers of such plants. This assessment failed to consider that As in land-applied CCFBs becomes less phytoavailable over time. Even when studies have found increased uptake of As in the year of CCFB application, plant As declined to insignificantly increased concentrations by the second

year and subsequent years (e.g., Guenmann et al., 1979). Further, many such studies were conducted with “disposal” rates of CCFB application, 50 or 100 T/A, which also increases potential for plant uptake due to temporary changes in soil electrical conductivity or dissolved organic carbon. Basic studies of the fate of soluble As added to soils also indicates that soil As becomes less phytoavailable after application, following natural soil chemistry of aging of trace element residues on adsorption surfaces. Consider repeated intermittent use over 100 year at limestone replacement rates, and the effect of CCFB constituents on bioavailability of soil As to plants, beneficial use of CCFB is not expected to comprise any risk in the environment through plant uptake. (PHS011)

Soil As is not biomagnified in terrestrial food chains. This important consideration was not discussed in the Risk Assessment. It is important that citizens recognize the difference in risk from trace elements which can be biomagnified in higher trophic levels and those which are clearly not biomagnified. Thus risk assessment for soil As or As in forage crops completes the risk assessment. (PHS011)

Research has been reported in the last decade on the bioavailability of soil As to mammals (Freeman et al., 1993; Freeman et al., 1995; Groen et al., 1993; Rodriguez et al., 1999). This work has been conducted in risk assessment for Superfund contaminated sites from mining, smelting, CCA-wood treatment, etc., as well as geogenic As bound in Fe oxides in soils (e.g. Groen et al., 1993). These studies have provided reliable data on bioavailability of soil As for use in risk assessment. The most applicable study, in which soil and house dust from a Cu smelter community were fed to monkeys (Freeman et al., 1995), showed that soil As bioavailability was low compared to arsenate used as the positive control, only about 10% of arsenate. A feeding study in the Netherlands with dogs also showed very low bioavailability of geogenic soil As, less than 10% (Groen et al., 1993). Because EPA failed to consider the low bioavailability to mammals of As in ingested soils at levels relevant to FFCB, EPA’s estimated risk is about 10-fold higher than it should have been found to be. Correction of this error alone would have prevented EPA from concluding that FFCB comprised risk when used on cropland. (PHS011)

The range of bioavailability of arsenic is as low as 10% but has been reported to be as high as 52%. Again, EPA needs to carefully scrutinize the information received in public comments regarding arsenic. Any decision to alter the assumptions used in the risk assessment must be supported by scientific data and be consistent with EPA’s risk assessment guidelines. (ALA00292)

Finally, it should be mentioned that the behavior of arsenic in the environment changes depending on the environmental conditions. The suggestion that one species predominates over the other under all conditions is incorrect. (ALA00292)

**XVI. ABOVE GROUND RISK MODELING**  
**C. Volatilization Pathways and Mercury in General**

Public interest group commenters expressed concern that the assessment did not account for potential exposure to volatile organic compounds through volatilization from landfills. Public interest group commenters also expressed concern that EPA did not consider mercury (particularly mercury volatilization) in its non-groundwater (i.e. above ground) risk assessment. One of the commenters considered this to be a significant oversight given that the risk of non-ground-water pathway mercury exposures was included in the ecological risk assessment. The commenter stated that if piscivorous bird mercury exposures have been assessed, EPA must be able to model the fate, transport, and bioaccumulation of mercury in the aquatic food chain and should therefore be able to assess human fisher exposures. An industry commenter suggested that the small quantities of mercury present were in a form unlikely to volatilize.

Response: As discussed in Section XIII, available data showed that organic constituents are infrequently present in FFC wastes at levels above analytical detection limits. This conclusion is consistent with the expectation that organics are destroyed in the combustion process or pass out the stack. Given this conclusion, and the absence of data showing the presence of organic compounds, the Agency did not consider organic compounds in its risk assessment.

Fate and transport of mercury in the environment was not modeled for the ecological risk assessment. Rather, mercury concentrations in surface impoundments were taken from the analytical data provided as the water concentrations from which ecological risk results were calculated. EPA noted this potential for ecological risk in this assessment. For human health, since impoundment concentrations would have limited relevance, EPA did consider volatilization and did perform modeling, as described next.

At the time the initial non-groundwater risk assessment was performed, the 1997 mercury Report to Congress (mercury RTC)<sup>47</sup> was being finalized. This evaluation did not include mercury volatilization. After consideration of the public interest group and industry comments, however, EPA undertook a further review of the scientific literature on volatilization and mobilization of mercury specifically in FFC wastes. The Agency concludes that while scientific research on this topic is progressing, the best available scientific data supports the contention that the percentage of mercury in FFC wastes not already volatilized in combustion does not easily volatilize when in the solid waste. We found no evidence to refute this.

It may, however, be blown about or transported overland and accumulate in fish, and we have now modeled these pathways, based on methodology resulting from the mercury Report to Congress, and reported this in the docket. No potential for risk to human health was calculated

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<sup>47</sup> Mercury Study Report to Congress. EPA. EPA-452/R-97-003. December, 1997.

from the mercury concentrations reported in available data. EPA plans to monitor and possibly re-examine this as wastes from potentially increased emission controls are considered.

**XVI. ABOVE GROUND RISK MODELING**  
**C. Volatilization Pathways**  
**Verbatim Commenter Statements**

This assessment fails to consider the most important pathway for mercury releases: the volatilization of mercury from landfills, impoundments, coal storage piles, fly ash and agricultural application. The air pathway is completely ignored in this analysis. The disposal and use of waste products which contain mercury raises the question of whether these wastes stabilize the mercury or act as additional downstream sources. Recent research suggests that mercury is not stable in most of these wastes and is subsequently emitted. Emissions of mercury from waste & waste products have been measured from landfills, contaminated soils, municipal waste sludge, chlor-alkali wastes and vegetation (Carpi et al., 1997; Carpi and Lindberg, 1997; Leonard et al., 1998). (ALA00036)

Despite the conclusion that mercury is “screened out” of the analysis based on TCLP results, the concentrations measured (even when the median values are taken) reveal that nationally, tons of mercury are being mobilized in these waste disposal sites. (ALA00036)

By not accounting for potential exposure to volatile organic compounds, the potential exposure from air emissions from landfills in the non-groundwater assessment, and the volatilization of organics from the use of groundwater in showering or bathing are not addressed. (ALA00036)

The most important pathway for mercury releases -- the volatilization of mercury from landfills, impoundments, coal storage piles, fly ash, and agricultural application -- apparently has not been considered at all in this Report. Indeed, it appears that the air pathway is completely ignored. (49CAO00058)

The human health risks of non-groundwater exposure to mercury were not modeled, even though mercury is an acknowledged constituent of co-managed FFC wastes, and a toxic chemical that is a priority pollutant for EPA. (ALA00292)

The second reason given for the lack of mercury modeling is basically that such modeling is difficult. While this is certainly true, the Agency has modified several models to specifically model mercury air dispersion, runoff and bioaccumulation. These models should be available from the Office of Research and Development. In addition, EPRI has developed the Mercury Cycling Model, which can be adapted for site-specific use. With regards to not having speciated mercury data, any mercury that will volatilize from the waste will be elemental mercury. The EPA models can be adapted to handle any speciation profile, including 100 percent elemental mercury. With the additional 6 month extension granted to EPA, mercury volatilization from the WMU's and agricultural application of FBC waste should be explicitly modeled. (ALA00292)

This is a significant oversight, particularly since the risk of non-groundwater pathway mercury exposures was included in the ecological risk assessment. (ALA00292)

However, if piscivorous birds have been modeled then it stands to reason that the fate and transport of mercury through runoff and overland transport has also been modeled as well as bioaccumulation in the aquatic food chain. Why then, couldn't mercury exposure to the human fisher be modeled. g:lven that mercury fish concentrations have obviously been estimated? (ALA00292)

What little mercury may be found in these combustion wastes is the oxidized form of mercury, and this form will not reduce back to elemental mercury or pose any significant risk of volatilization. Thus, even though EPA did not eliminate mercury from consideration in the risk analysis, EPA was correct in its conclusion that mercury is not a constituent of concern in co-managed coal combustion wastes. (USWAG0037)



**XVI.**  
**ABOVE GROUND RISK MODELING**  
**D. Cumulative Exposures**

One public interest group commenter expressed concern that the person exposed to metals from fish consumption is not exposed to any other potentially contaminated food. The commenter suggested the assessment should account for existing fish consumption advisories for two constituents: methyl mercury and selenium.

Response: EPA agrees that there is potential for an individual to be exposed to fish as well as other contaminated foods. The farmer or the farmer's child will be exposed through the ingestion of home grown fruits, vegetables, milk, fish and beef products. The fisher, however, will be exposed by virtue of his high intake of fish, but is presumed to procure other foods from non contaminated sources. These represent very different exposure patterns. In this analysis, risks to the fisher consistently were orders of magnitude greater than risks to the farmer, and these were the primary risks in the above ground analysis. (Note: This was the case for all scenarios except for agricultural use, where the farmer scenario dominated.) It should be noted, however, that concentrations in fish issue predicted in the FFC analysis were below fish advisory levels. This does not in any way diminish the force of such advisories.

In accordance with EPA guidance, all potentially cumulative risk pathways associated with each exposure scenario were investigated. Risks were summed if occurring together in the same time and space, for similar toxicological endpoints.

**XVI. ABOVE GROUND RISK MODELING**  
**D. Cumulative Exposures**  
**Verbatim Commenter Statements**

In the receptors evaluated in the non-groundwater risk assessment, the person exposed to metals from fish consumption is not exposed to any other potentially contaminated food. EPA found no risks associated with consumption of fish potentially contaminated by FFC waste. However, EPA did not account for existing fish consumption advisories for two waste constituents: methylmercury and selenium. (ALA00036)

**XVI. ABOVE GROUND RISK MODELING**  
**E. Input Values for Assessing Risk to Children**

Industry and academic commenters questioned the soil ingestion rate used for children, variously stating that it should have been 100 to 400 mg/day at the high-end. Another commenter directed criticism at a number of input values used, including ingestion rate, exposure frequency, exposure duration, and body weight, indicating that the selection of overly protective estimates for all these inputs resulted in overestimation of risk.

Response: Comments on ingestion rates are addressed in detail in Section VIII of these comments and responses.

EPA notes, however, that cancer risk estimates for a child (or adult) are not based exclusively on a 70-year exposure period as stated by one of the commenters. Risk estimates are provided for central tendency calculations (i.e., all parameters are set at a mean or median value) and a reasonable high-end scenario (two parameters are set at high-end values while all other parameters remain at central tendency values). The two driving high-end parameters for children in this study were soil intake and waste concentration (i.e., this combination of high-end parameters yielded the highest risk results). The exposure duration for children's soil ingestion was set at the central tendency value of 6.0 years. Other exposure factors for children (e.g., eating, breathing) were set at central tendency values as well.

EPA further notes that exposure variables are all specified in the EPA's Exposure Factors Handbook (EFH). These include ingestion rates, exposure durations, exposure frequency, and body weight. It is true that the calculation of an RfD is based partly on these exposure assumptions, but EPA believes that highly exposed subpopulations are relevant to developing chemical exposure risk estimates. RfD calculations typically contain central tendency values, in that high end risks are considered in setting other model input variables.

EPA also reiterates, as noted in Section VIII, that the ongoing review of arsenic toxicity may require re-visiting this analysis.

**XVI. ABOVE GROUND RISK MODELING**  
**E. Input Values for Assessing Risk to Children**  
**Verbatim Commenter Statements**

In fact, USEPA updated its soil ingestion rates in the Exposure Factors Handbook (1996) to reflect realistic ingestion rates for children. In this document, EPA recommends using a soil ingestion rate of 100 mg/day as an average concentration and 400 mg/day as an upper percentile rate. Therefore, the use of 1,000 mg soil/day grossly overestimates risks to children. (PG&E00023)

Children normally ingest soil for a period of up to six years, but the risk assessment assumed 'exposure to soil arsenic over a lifetime (70 years) of ingestion. (NMA00024)

Excessive child soil ingestion rate of 1000 mg/day. Previous EPA health risk analyses considered ingestion rates of 100 or 200 mg per day as the high-end exposure. (USWAG0037)

Furthermore, there is a consensus in the scientific community that modeling a child soil consumption period of 6 years using an RfD derived from a cancer slope factor based on a 70 year exposure period, as EPA did, results in a significant over-prediction of risk. (USWAG00037)

The ash ingestion rate used in the risk analysis was 1000 mg/day, compared to 100 - 200 mg/day as used in previous EPA health risk analyses. (NSPS00057)

Epa made important errors in the assumption about soil ingestion. In all previous risk assessment form soil ingestion, EPA has used 100 or 200 mg soil per day as "high-end" exposure. Data from study of soil ingestion by free-living children, after correction and re-interpretation as the quality of the soil estimation based soil-borne element is feces, showed that the geometric mean soil ingestion was only about 20-30 mg/day, and that the 95<sup>th</sup> percentile of soil ingestion was no higher than 150-200 mg/day. And these numbers are the values listed in the EPA Exposure Factors Handbook (1996) which is available online. It should be recognized that soil ingestion measurement has improved over the last decade and the results were reviewed more thoroughly by the scientific community. The team lead by Calbrese at the University of Massachusetts has "corrected" their methods to calculate soil ingestions based on food and fecal analysis repeatedly over this period, each time achieving greater reliability in ingestion estimates (see Stanek and Calabrese, 1995, wher the <250 : m particle size of the "soil" presumed to be ingested was used in the calculation rather than the composition of soil sieved to < 2 mm). The 95<sup>th</sup> percentile level of exposure is EPA's definition of "high-end" exposure, but EPA assumed 1000 mg soil/day according to the published FFCB risk assessment ... Correction of this error would have independently prevented EPA from concluding that beneficial use of FFCW comprised risk from As. (PHS011)

Exposure Frequency (EF): This factor, in d/y is set by EPA at 350 for many risk assessments; this means the individual is exposed to the contaminant for this many days per year, and in the case of the child ingesting soil, that such ingestion occurs nearly every day. Chaney and Ryan (1994), among others, have criticized this assumption as unrealistic, given that weather conditions, parental supervision, and many other factors would reduce exposure far below this frequency. It would seem more realistic to use the percentile approach for this factor, rather than assign it a fixed (maximum) value. In a temperate climate children might only be exposed about 175 d/y as a central tendency; the 95<sup>th</sup> percentile might then be set at 350 d/y. This estimate assumes the largest exposure is due to children playing directly in contaminated/amended soil in outdoor play areas. (PHS018)

Exposure Duration (ED): Pica or pica-like behavior is typically associated with young children (age <6). In their assessment of FBC risk, RTI use 6 y as the 50<sup>th</sup> percentile, and 18 y as the 95<sup>th</sup> percentile. Certainly this later value must be considered extreme, if not pathological. Once children enter school it seems likely that extreme pica behaviors would be curtailed due to greater supervision; the author believes ED should be set at 6 y the 95<sup>th</sup> percentile, and a 50<sup>th</sup> percentile more reasonably set at 3 y. (PHS018)

Ingestion Rate (IR): Considerable debate surrounds the rate of soil ingestion by children; RTI used 0.2 g/d (0.0002 kg/d) as the central tendency, and 1 g/d as the high end. Chaney and Ryan (1994) suggest 0.5 g/d as the 95<sup>th</sup> percentile, and note that research measuring soil ingestion has often “grossly overestimated” this factor by systematic errors in experimental methods. The author suggest 0.1 g/d as a central value and 0.5 g/d at the high end case. (PHS018)

Body Weight (BW) is the exposed individual’s mass, but since this varies over time of exposure, there is judgement involved in its selection. In the RTI report, the most conservative (i.e., lowest) body weight is used, which is 12.3 kg for a 1-2 y old child. This mass is important in the assessed risk, since intake is computed as mg As per kg body weight per day. DOE (no date) shows a weighted average approach to account for changes in both IR and BW over various time segments of exposure time (ED). (PHS018)

**XVI. ABOVE GROUND RISK MODELING**  
**F. Source Term**

A public interest group commenter stated that the underlying analytical data for the ash and porewater samples did not list thallium or beryllium as analytes, so it is unclear where the input data for the non-groundwater pathways came from for these metals.

Response: Appendix B of the risk assessment background document<sup>48</sup> presents the analytical data that were used in the analysis. Table B-2 presents the data for comanaged coal combustion wastes from utilities and these data were used for both the utility and non-utility comanaged coal combustion waste streams. Table B-4 presents similar data for the FBC waste streams.

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<sup>48</sup> FF2P-S0370.

**XVI. ABOVE GROUND RISK MODELING**

**F. Source Term**

**Verbatim Commenter Statements**

We note, however that the underlying analytical data for the ash and porewater samples does not list thallium or beryllium as analytes, so it is unclear where the Input data for the non-groundwater pathway came from for these metals. (ALA00292)

## **XVI. ABOVE GROUND RISK MODELING**

### **G. Distance to Receptor**

A public interest group commenter argued that, rather than selecting preset distances to the receptor, the receptor should be placed at a location where the modeled concentration represents the 50<sup>th</sup> and 95<sup>th</sup> percentile. The commenter also argued that a high-end analysis would place the active cell of the landfill along the boundary of the landfill, not the center, and was concerned that no information was available on the distance of the agricultural field from the landfill. The commenter stated that, as modeled, air emissions are emanating from the center of the landfill, which in the case of the large CCW landfill is actually 576 meters from the boundary of the landfill, putting the high-end receptor at 651 meters away (not 75 meters) and the 50<sup>th</sup> percentile receptor at 876 meters (not 300 meters). The commenter further stated that the analysis of deposition and runoff to the stream seems to arbitrarily select the stream to be 75 meters from the boundary of the agricultural field, placing the stream from 0.8 miles to over a mile from the emission source.

Response: EPA agrees that the lack of data on receptor distances introduces uncertainty into the analysis. Indeed, EPA acknowledges that receptor placement for exposure scenarios developed to represent national risk profiles is a difficult undertaking. Consequently, the Agency has invested considerable resources to develop modeling tools and databases for site-based analyses that may be used to increase the level of resolution in national assessments such as that performed for FFC. However, until independent testing of this “site-based” methodology has been completed, modeling requires that receptors be placed at discrete distances from the waste management unit.

EPA currently uses on receptor data based on a statistical survey of treatment, storage, and disposal facilities (TSDFs).<sup>49</sup> Statistical analysis of data indicates that the distance to the nearest residence is 250 feet (or approximately 75 meters, for high end risk) and the typical distance to the nearest residence is 1,000 feet (or approximately 300 meters, for central tendency risk), based on the median distance in a random sample of distances to the nearest residence; both values represent the distance from the edge of the waste management unit to the residence. EPA regards this database as the most appropriate source for typical and high-end receptor distances and, lacking other information on receptor distances, will continue to use these values in risk modeling efforts.

EPA disagrees with the commenter's suggestion that receptor distance be placed according to the 50<sup>th</sup> and 95<sup>th</sup> modeled concentrations. Placing receptors at central tendency and high-end concentration values does not bear any relationship to actual distances. Receptor distances should be considered as independent variables.

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<sup>49</sup> 55 FR 25454.



The commenter is correct in asserting that EPA assumed that the emissions source was from the center of the landfill. EPA believes that it is appropriate to locate the emissions source at the center of the landfill rather than at any cell along the edge for the following reasons. Because the landfill model assumes that active cells are retired as new cells come on-line, the emissions source in the landfill would be moving over time. Modeling the emissions source as the center of the square landfill results in an effective average over time that covers all of the active cells in the landfill. The commenter is correct in implying that, for short periods of time, the location of the active cell relative to the receptor could be a critical determinant of exposure. However, “turning on” the active cell closest to the receptor implies a level of knowledge that is absent in a representative exposure assessment (i.e., the analysis is not site-based). In essence, this would serve to compound conservative assumptions without a sufficient technical basis to do so.

For all scenarios except agricultural soil amendment, the stream is not arbitrarily set at 75 meters from the agricultural field. The overland transport model defines a watershed subbasin drainage system that is based on the relative sizes of the waste management unit and the receiving field (i.e., the area of the agricultural field, home garden, or pasture). The drainage subbasin is made up of two, square, equal sized components (one contains the waste management unit and the other contains the receiving field). The area for each of these subbasin components is equal to the area of the waste management unit or the receiving field, whichever is larger (this results in a buffer area around the smaller of the two). If the waste management unit is larger than the receiving field, the distance from the receiving field to the stream is based on the size of the receiving field relative to the size of the subbasin component (which, for this scenario, is set equal to the waste management unit). The larger the receiving field relative to the subbasin area, the closer it will be to the stream. Under this construct, the stream could be greater than or less than 75 meters from the receiving field. If, however, the receiving field is larger than the waste management unit, then the subbasin area will be defined by the area of the receiving field. In this case, the stream will abut the receiving field. The overland transport model is detailed in Appendix C of the non-groundwater risk assessment technical background document.<sup>50</sup>

The distance to the stream for the agricultural soil amendment scenario was set at 75 meters. EPA has been unable to identify any suitable data sources to locate the stream relative to the agricultural field. EPA was concerned with compounding the conservative assumptions built into the erosion and runoff models and was reticent to place the stream immediately adjacent to the agricultural field.

It should be noted that analyses of this simplified system revealed that the stream distance is not an important determinant of the surface water load from the landfill due to model construct and the fact that the system reaches steady state within the simulation period.

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<sup>50</sup> FF2P-S0370.

The agricultural field, home garden, and residential plot were all assumed to be 300 meters and 75 meters from the source for central tendency and high-end respectively.

**XVI. ABOVE GROUND RISK MODELING**  
**G. Distance to Receptor**  
**Verbatim Commenter Statements**

The inhalation scenario for the CCW and FBC onsite landfills is not a conservative analysis, insofar as the assumed distances to receptor. (ALA00292)

The problem with this approach is that the emissions, as modeled, are emanating from the center of the landfill, which in the case of the large CCW landfill is actually 576 meters from the boundary of the landfill, which puts the high-end receptor at 651 meters away (not 75 meters) and the 50th percentile receptor at 876 meters (not 300 meters). (ALA00292)

Rather than selecting pre-set distances to the receptor, the receptor should be “placed” at the location where the modeled air concentration represents the 50th and 95<sup>th</sup> percentile. This would better reflect the exposure of potential central tendency and high- end receptors. In addition, a high-end analysis would place the active cell of the landfill along the boundary of the landfill, not the center. (ALA00292)

The analysis of deposition and runoff to the stream seems to arbitrarily select the stream to be 75 meters from the boundary of the agricultural field. When the distance from the active cell of the landfill is calculated, and assumptions are made about the shape of the field (i.e., square or rectangular), this places the stream from 8/10th of a mile to over a mile from the emission source. (ALA00292)

In addition, no information is provided about the distance of the agricultural field from the landfill. Thus distance affects the concentration of constituents from air deposition. (ALA00292)

## **XVI. ABOVE GROUND RISK MODELING**

### **H. Exposure Duration**

A public interest group commenter stated that the exposure duration for elderly residents may be far longer than the 33 years assumed in this risk assessment.

Response: The above ground risk assessment used high-end exposure durations of 32.3 for the adult resident, the home gardener, and the adult fisher and 58.4 years for the farmer. These exposure durations are based on data presented in the Exposure Factors Handbook. EPA acknowledges that there is the potential for an individual to have an exposure duration that is longer than these assumptions; however, EPA feels that these values are reasonable high-end values (reflective of a 95<sup>th</sup> percentile exposure duration) for a national assessment. It should also be noted that both cancer and non-cancer human health benchmarks are intended to be protective of sensitive sub-populations including children and the elderly.

**XVI. ABOVE GROUND RISK MODELING**  
**H. Exposure Duration**  
**Verbatim Commenter Statements**

These facility-specific maps illustrate that there are real people living near power plant FFC waste facilities, not just “hypothetical receptors”. Included in these populations are children, who are a more sensitive subpopulation and the elderly whose duration of exposure may be far longer than the 9 years estimated for the “high-end” groundwater exposure and the 33 years estimated for the “high-end” non-groundwater exposure. (ALA00292)

## **XVII. ECOLOGICAL RISK ASSESSMENT**

Many public interest group commenters provided input on the design of the ecological risk assessment and the specific assumptions used in its application. Comments included criticism of field data and damage case assessment, of receptor and end point evaluation, and of pathways considered. Specific concerns are summarized below in this section.

Response: EPA believes the design of its ecological risk assessment was appropriate and based on state-of-the-art science. EPA also believes that the assumptions and input values it used in the ecological risk assessment were appropriate, given the specific characteristics of FFC wastes and the environmental settings of FFC facilities. Field (literature) data were considered, and significant pathways and receptor/end point combinations were considered, with the caveat that resource constraints necessitated emphasizing human health risk assessment.

The responses below address the concerns raised by the commenters about the ecological risk assessment in more detail. As noted, resource constraints dictated that human health risk assessment be emphasized in situations where funding allocation was critical. EPA did nonetheless find the potential for risk to specified receptors when exposed to concentrations to be found in large impoundments or in overflow from such impoundments.

## **XVII. ECOLOGICAL RISK ASSESSMENT**

### **Verbatim Commenter Statements**

Documented ecological damages are overlooked by the Report. We find the shortcomings in EPA's assessment of the potential ecological risk presented by CCW to be unacceptable. (HEC00056)

With limited time and resources, we have been able to find evidence that ecological risks from CCW are not just theoretical, are not mostly limited to large surface impoundments, and should not only be examined for mammals, birds, and amphibians. Studies would indicate that selenium contamination from CCW does travel through the food chain and poses a danger to both ecosystems and humans. Furthermore, they indicate the need for more study on bioaccumulation of contaminants found in CCW. The cases listed above also show that contamination from CCW transported through subsurface pathways can cause damage to organisms. At the very least, EPA should take the necessary time to fully evaluate these two factors. EPA has not gathered existing, easily accessible information on ecological damage that can and has been caused by CCW and therefore cannot legitimately make the claim that no evidence of ecological impact exists. (HEC00056)

Despite the availability of field data, the analysis relied on modeling potential impacts. (ALA00036)

While field information on ecological damage is included in both the risk assessment and materials in the docket, the Report contends that there is "no documented or anecdotal ecological impact information with which to compare the risk modeling results." (3-74). It is never made clear why the information cited in the risk assessment is not considered either "documented or anecdotal." (ALA00036)

The only indication that fish may be affected by surface impoundments comes in the conclusion of the risk assessment on page 85 where the authors suggest that birds may not be at risk at these waste units because "the absence of fish and aquatic invertebrates may limit the capacity of ponds to support large populations of birds." We feel that it is a serious oversight that no attempt was made to answer this question for the risk assessment. (ALA00036)

The assessment suffers from not including an analysis of FFC releases on estuarine systems and associated receptors. (ALA00036)

When tentatively concluding that wastes should remain exempt from Subtitle C, the Report indicates that uncertainty is more related to "unavailability of information on actual receptor exposure rates." (3-74). As indicated in earlier comments, we disagree with this assertion and

support the statement in the risk assessment “the absence of data cannot be construed to mean that adverse ecological effects will not occur.” (p.75) (ALA00036)

More information about the ecological impacts of current management and disposal practices for co-managed FFC wastes can and should be gathered from the published peer-reviewed literature before a regulatory determination is made not to subject co-managed wastes to regulation under Subtitle C. (ALA00292)

The Report indicates that there is no site-based work by which to support modeling data showing potential ecological risk from the disposal and utilization of fossil fuel wastes - even though the RTI work prepared for EPA indicates quite the contrary. (ALA00292)

From an ecological perspective, the question that needs to be answered is at what tissue concentrations are fish negatively affected by selenium and what water concentrations yield this fish tissue concentration. (ALA00292)

Because of emerging questions of the bioaccumulation factors associated with selenium, EPA’s Office of Water is currently conducting a review of the ambient water quality criterion for selenium ... Any Regulatory Determination should also maintain some flexibility to deal with a changed selenium water quality criterion in 2001. (ALA00292)

What is clear is that ecological impacts extend beyond the disposal site. With surface impoundments, there is demonstrated evidence that aquatic populations are negatively impacted by the discharge waters from impoundments. In addition, there is data showing that unlined sites will degrade the microbiota of waters beneath disposal sites. (ALA00292)



## **XVII. ECOLOGICAL RISK ASSESSMENT**

### **A. Failure to Consider Field Data**

Public interest group commenters expressed concern that the ecological risk assessment failed to consider field data on ecological risks. One of the commenters suggested that the lack of observational data is due to reliance on industry data. This commenter further stated that more information about the ecological impacts can and should be gathered from the published peer-reviewed literature. This and other commenters identified several candidate cases of ecological damage and studies of ecological effects.

Response: EPA agrees, of course, that case studies and field data must support the ecological risk assessment process. As described in the non-groundwater risk assessment technical background document, EPA evaluated case study data and journal articles covering a number of site investigations including, but not limited to, Belews Lake in North Carolina, Martin Lake in Texas, and the Savannah River Site in Aiken, South Carolina. This review was used to (1) identify the constituents of potential concern (e.g., selenium was of particular concern at several sites), (2) identify key exposure pathways (e.g., the bioaccumulation of selenium through the food web was correlated with adverse effects to reproducing populations of birds), and (3) identify particularly sensitive species (e.g., amphibian populations were highly impacted by exposure to FFC wastes). A number of articles were identified linking adverse effects in amphibians with exposure to sluiced ash that was pumped into a series of settling basins, and ultimately, into a 2-hectare drainage swamp that received effluent from other coal ash settling basins.<sup>1</sup>

We reviewed the information on ecological damage submitted by commenters and agree that four of the seven submitted are documented damage cases that involve fossil fuel combustion wastes. All of these involve some form of discharge from waste management units to nearby lakes or creeks. These confirm our risk modeling conclusions as presented in the RTC that there could be adverse impacts on amphibians, birds, or mammals if they were subject to the elevated concentrations of selected chemicals that had been measured in some impoundments. This will be considered in any subsequent evaluation of potential risks from fossil fuel combustion wastes.

Although case studies are useful tools for the problem formulation phase, they do not provide a sufficient basis from which to draw risk conclusions for a national assessment. In addition to numerous confounders in those studies (e.g., multiple stressors), the release and exposure scenarios were not always relevant to the current risk analysis. In many instances, the case studies present mismanagement scenarios no longer used. As a result, these studies must be carefully weighed with respect to their applicability to analysis of FFC waste.

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<sup>1</sup> See Christopher L. Rowe, Owen M. Kinney, Alison P. Fiori, and Justin D. Congdon. Oral Deformities in Tadpoles (*Rana Catesbeiana*) Associated with Coal Ash Deposition: Effects on Grazing Ability and Growth. *Freshwater Biology* 36, 723-730. 1996.

The evidence of ecological damages identified in several studies was also used in the selection of assessment endpoints and in the development of the conceptual model during the problem formulation phase. In addition, this information was considered in the risk characterization in interpreting the results of the modeling simulation and in identifying uncertainties in the analysis (e.g. ground water to surface pathway was not modeled).

## **XVII. ECOLOGICAL RISK ASSESSMENT**

### **A. Failure to Consider Field Data**

#### **Verbatim Commenter Statements**

Documented ecological damages are overlooked by the Report. We find the shortcomings in EPA's assessment of the potential ecological risk presented by CCW to be unacceptable. EPA states in the Report that only theoretical information exists on the ecological damage that can be caused by CCW. We have found several documented cases where CCW contamination has led to ecological damage. HEC will provide more detailed information on these cases if given more time to comment. However, given the current time constraint we can only give this basic overview of what was found. (HEC00056)

One of the documented cases of ecological damage caused by CCW is presented by EPA as one of its six damage cases in the report on fossil fuel wastes released in 1993, the release of 130 million gallons of caustic solution into the Clinch River in Virginia. Virtually all bottom dwelling fish were killed within 3 to 4 miles of the spill, and large numbers of fish were killed up to 90 miles from the spill. EPA does not even mention this spill in its assessment of ecological damage. (HEC00056)

The U.S. Fish and Wildlife Service has done extensive studies on the ecological effects of selenium concentration at Martin Lake in Texas. High selenium concentrations in the lake were the result of the dumping of fly ash into the lake, and caused massive fish kills over a nine month period. Samples of restocked fish taken five years later showed selenium levels in the fish to be 9-21 higher than the national mean of 1.9 ppm dry weight. Studies also revealed potentially toxic levels of selenium in omnivorous and insectivorous birds nesting close to the lake. The study showed that the selenium contamination had traveled through the food chain to contaminate virtually every component of the Martin Lake ecosystem including fish, both adult birds and eggs, and invertebrates. We would suggest EPA take the time to contact the Fish and Wildlife Service to obtain what information they have on ecological damage caused by CCW before they make such a broad statement as no documented information exists. (HEC00056)

The Texas Department of Health was forced in 1992 to issue a fish consumption advisory for three reservoirs in Texas; Martin Creek, Brandy Branch, and Welsh. Selenium contamination from CCW was the reason for these advisories. Children under 7 and women who are pregnant or may soon be pregnant were advised not to eat any fish from these reservoirs. Officials at the Department of Health expected to have to enforce the advisory for some time, and that the selenium contamination would also affect fish restocking programs these reservoirs. Clearly, the CCW is having a long-term ecological impact on the reservoirs, and this impact presents a threat to human health. (HEC00056)

Articles published both in the “Journal of Herpetology” and the “Canadian Journal of Zoology” link high levels of heavy metal contamination in amphibians to CCW storage in nearby water ways. Elevated levels of arsenic, cadmium, selenium, strontium, and mercury were found in bullfrog tadpoles and softshell turtles living in and around a fly ash basin located close to the Savannah River in South Carolina. When compared with tadpoles from a pond unaffected by fly ash, the tadpoles from the basin were found to have a much higher rate of behavioral abnormalities. Part of the research of the Savannah River site was conducted by the Department of Energy so we do not understand why EPA is having such difficulties finding this information. (HEC00056)

EPA declares in its Executive Summary, Section 3 page 6, that large surface impoundments can theoretically pose risks to birds, mammals, and amphibians. EPA discounts the idea of taking any action to reduce the risks posed by large surface impoundments on two factors, there is no information on the actual ecological risks posed by large surface impoundments and the cost of eliminating such impoundments is too high. Both of these statements are completely unsubstantiated. HEC has found documented cases of ecological damage occurring at large surface impoundments. At least two of these cases were investigated by other federal agencies which should provide easily accessible information to EPA on this issue. (HEC00056)

With limited time and resources, we have been able to find evidence that ecological risks from CCW are not just theoretical ... EPA has not gathered existing, easily accessible information on ecological damage that can and has been caused by CCW and therefore cannot legitimately make the claim that no evidence of ecological impact exists. (HEC00056)

What field data is being used in the ecological risk assessment? It is very hard to understand how field data has been used in the analysis. For instance, page 54 of the risk assessment summarizes field data. However, this paragraph serves more to provide a backdrop to the ecological issues than to provide field data that is used in the risk assessment. Despite the availability of field data, the analysis relied on modeling potential impacts. (ALA00036)

Of the twelve waterbodies in the country with selenium fish advisories, six are located at sites that have received wastewater from coal waste and/or coal waste impoundments. Three of these advisories in Texas - Welsh Reservoir, Brandy Branch Reservoir, and Martin Creek Reservoir - are included in the docket of the Report, although there is no discussion of them in the risk assessment. Not included in the docket is information about advisories at Belews and Hyco Lake in North Carolina and Sweitzer Lake in Colorado. (ALA00036)

While field information on ecological damage is included in both the risk assessment and materials in the docket, the Report contends that there is “no documented or anecdotal ecological impact information with which to compare the risk modeling results.” (3-74). It is never made clear why the information cited in the risk assessment is not considered either “documented or anecdotal.” That there is no actual information about the scale and frequency at which receptors are actually

exposed "... to quantify the magnitude of the actual ecological impacts" at surface impoundments" (3-74), is likely due more to a reliance on voluntary, industry-derived data than to actual in availability of data. (ALA00036)

When tentatively concluding that wastes should remain exempt from Subtitle C, the Report indicates that uncertainty is more related to "unavailability of information on actual receptor exposure rates." (3-74). As indicated in earlier comments, we disagree with this assertion and support the statement in the risk assessment "the absence of data cannot be construed to mean that adverse ecological effects will not occur." (p.75) (ALA00036)

More information about the ecological impacts of current management and disposal practices for co-managed FFC wastes can and should be gathered from the published peer-reviewed literature before a regulatory determination is made not to subject co-managed wastes to regulation under Subtitle C. (ALA00292)

We commend Research Triangle Institute (RTI) for conducting an extremely thorough literature search on the ecological damage associated with fossil fuel wastes, as background to the Report to Congress. The journal articles included in the references to their Draft Final Report, Non-groundwater Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2 (FFC2) are excellent. What is surprising is that the Report to Congress is written as if RTI's good work and these articles and the issues they raise do not exist. In fact, the Report indicates that there is no site-based work by which to support modeling data showing potential ecological risk from the disposal and utilization of fossil fuel wastes - even though the RTI work prepared for EPA indicates quite the contrary. (ALA00292)

While the RTI risk analysis takes the first step in identifying the research that has looked at ecological issues associated with fossil fuel combustion by-products, it is only a first step. More must be done to look at the literature to determine what is known about the ecological impacts from these wastes. At the same time, it is critical to know where the gaps in our collective knowledge base lies regarding ecological impacts and figure out how to answer the most critical of the ecological questions. (ALA00292)

There are a number of scientists concerned about flushing CCW into underground exhausted coal mine shafts due to trace metal toxicity from fly ash particles accompanied with high levels of conductivity, total dissolved solids (TDS), and sodium (Na). The last three parameters, by the way, do not have national water quality criteria (WQC) restrictions to protect aquatic life. I have found that effluents with conductivity approaching 4,000 mmhos/cm, 2,640 mg/L TDS, and 900 mg/L Na/L to be acutely toxic to *Ceriodaphnia dubia* in my recent research efforts of the latter 1990's. A number of groundwater wells associated with CCW landfills exceed these limits according to data being generated by the HEC. They are condensing their data and will make it available to you shortly. (VATL0010)

The enclosed packet includes some of our recent peer-reviewed publications on environmental impacts of coal combustion wastes in South Carolina. While downstream water quality parameters at our study site are within the NPDES criteria, the 40 hectare disposal area is heavily contaminated and used by many aquatic, terrestrial, and avian species. In several species, exposure to coal ash and accumulation of trace elements is associated with deformities which affect feeding and swimming, behavioral modifications that increase susceptibility to predation, disruption of endocrine systems, severe modifications to energy budgets, inability to complete metamorphosis, and impaired reproduction. Research by other investigators in other states (for example, North Carolina and Texas) indicate that biological responses to coal ash may be widespread. We hope that the enclosed materials will be useful in producing your Report to Congress on Coal Combustion Wastes. (SRELXXXX).

## **XVII. ECOLOGICAL RISK ASSESSMENT**

### **B. Receptors Considered**

Several public interest group commenters expressed concern that the assessment did not consider receptors other than birds, mammals, and amphibians. Commenters expressed specific concern about fish (particularly with regard to selenium and bioaccumulation), plants, and invertebrates. One of the commenters cited extensive research on the ecological impacts of selenium in fish. This commenter stated that, because of emerging questions of the bioaccumulation factors associated with selenium, EPA's Office of Water is currently conducting a review of the ambient water quality criterion for selenium.

Response: The non-groundwater risk assessment technical background document<sup>2</sup> describes the suite of assessment endpoints and ecological receptors selected to represent freshwater and terrestrial systems. Risks to this suite of ecological receptors were evaluated for indirect exposure pathways; that is, constituent releases from the unit, transport in the environment, and exposure through the food chain and direct contact and/or ingestion with contaminated media were predicted. For the freshwater ecosystem, these receptors included mammals and birds, amphibians, aquatic community (e.g., fish and aquatic invertebrates), benthic community, and algal and aquatic plants. For the terrestrial ecosystem, these receptors included mammals and birds, the soil community (e.g., earthworms), and terrestrial plants. Based on the results of this modeling exercise, significant risks were not indicated for these receptors for either the high-end or central tendency exposure scenarios (beyond the risks noted for the impoundments themselves, see following).

In addition to the assessment of indirect exposure pathways, EPA also evaluated the potential impacts from direct exposure to surface impoundments. This simulation selected a subset of the suite of ecological receptors based on case study data suggesting that this subset may be adversely affected through direct exposures to contaminated impoundment waters. These receptors included mammals, birds, and amphibians. The aquatic community, the benthic community, and aquatic plants were excluded from this analysis because surface impoundments are not designed as habitat for aquatic life and, therefore, are not subject to the same standards as surface waters. Based on the results of this assessment, the potential for adverse ecological effects was indicated for all three receptor groups considered (i.e., mammals, birds, and amphibians) at both high-end, and central tendency constituent concentrations in the impoundment. These findings were supported by the case study data reviewed and presented in the Technical Background Document. As noted in the Technical Background Document, however, there is considerable uncertainty in delineating the ecological significance of these results given the screening-level approach adopted for this analysis.

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<sup>2</sup> FF2P-S0370.

The chronic ambient water quality criterion currently available for selenium was used in this analysis to estimate the potential ecological risks to the freshwater community. EPA is reviewing this criterion based on new information related to the toxicity and chemical speciation of selenium in surface water. Pending this review, EPA may choose to revise the selenium criterion used to evaluate FFC wastes. The mammalian surface water criterion for selenium was used to calculate hazard quotients because it was an order of magnitude lower than the freshwater community criterion. Consequently, the risk estimates will not change significantly unless the freshwater community criterion is lowered by more than an order of magnitude.



## **XVII. ECOLOGICAL RISK ASSESSMENT**

### **B. Receptors Considered**

#### **Verbatim Commenter Statements**

The Report also only takes into account the potential risk to mammals, birds, and amphibians. EPA has ignored the risk to both fish and plants when documented cases exist of CCW contamination plumes causing death among these organisms. This oversight is especially serious in the case of plants when water flowing out of CCW disposal sites has regularly been shown to have boron concentrations several times what is considered to be toxic to plants. The report also does not consider any possible risk to invertebrates. Invertebrates can be used as an excellent indicator of environmental quality. Species composition of the invertebrate community is commonly used to evaluate stream quality. There is no valid reason not to consider these organisms when examining potential ecological risk. (HEC00056)

With limited time and resources, we have been able to find evidence that ecological risks from CCW ... should not only be examined for mammals, birds, and amphibians. Studies would indicate that selenium contamination from CCW does travel through the food chain and poses a danger to both ecosystems and humans. Furthermore, they indicate the need for more study on bioaccumulation of contaminants found in CCW. (HEC00056)

It is particularly surprising how fish are evaluated in the ecological risk assessment. While fish are included in Table 6-1 - Suite of Assessment Endpoints Considered for the FFC ERA, the risk assessment for surface impoundments does not treat them as a receptor group. This makes no sense, particularly with regards to selenium, where toxicity to fish has been documented in waterbodies where selenium-rich wastewater was released from surface impoundments used for coal waste disposal. Selenium can bioaccumulate in aquatic food chains and become a concentrated dietary source that is toxic to fish and wildlife (Lemly and Smith, 1987, Lemly, 1993). Dietary selenium is passed from parents to offspring's in the eggs and causes congenital malformations and reproductive failure (Lemly, 1997). There is documented evidence of reproductive failure and teratogenic effects in a number of exposed fish species (Lemly, 1997). Because of its ability to bioaccumulate, relatively low concentrations - 10 : g/l - have been shown to accumulate at levels high enough to cause teratogenic effects. (EPA's national water quality criterion for selenium is 5 : g/l.) (ALA00036)

Not only is there an impact on fish, but selenium in fish poses risks to humans as well. Of the twelve waterbodies in the country with selenium fish advisories, six are located at sites that have received wastewater from coal waste and/or coal waste impoundments ... All these advisories call for limiting consumption of fish because of the dangers to humans of high levels of selenium found in the fish tissues. Because there is no discussion and assessment about selenium in fish, it is not possible to know the extent to which this may be occurring. Systems that tend to accumulate selenium are shallow wetlands and marshes and reservoirs with low flushing rates. In these

systems, biological productivity is often high, and selenium may be trapped through immobilization processes or through direct uptake by organisms (Lemly 1997). How many of the surface impoundment discharge into waters like that meet this definition? Both the industry and states may be sources for this information, but it is fair to assume that there are some waterbodies that meet this definition. In his comments to EPA's Peer Consultation and Workshop on Selenium Aquatic Toxicity and Bioaccumulation on May 27-18 1998, Robin Reach of the Utility Water Act Group, an association of 95 individual electric utility companies and three national trade associations of electric utilities, stated that his group was "interested in EPA's re-evaluation of the freshwater chronic aquatic life criterion for selenium" because wastewaters from utilities "that use wet ash disposal of coal fly ash and bottom ash...are discharged to all types of waterbodies." (ALA00036)

The only indication that fish may be affected by surface impoundments comes in the conclusion of the risk assessment on page 85 where the authors suggest that birds may not be at risk at these waste units because "the absence of fish and aquatic invertebrates may limit the capacity of ponds to support large populations of birds." We feel that it is a serious oversight that no attempt was made to answer this question for the risk assessment. (ALA00036)

We know that selenium is found in aquatic ecosystems at elevated levels, in part because there are 12 fish advisories for selenium in the United States. These advisories have been set because selenium concentrations in fish tissues are high enough (5 mg/kg wet weight for North Carolina; impoundment-based standard in Texas) to cause brittle hair and deformed nails and loss of feeling and control in the arms and legs of persons consuming contaminated fish. In the case of five of the fish advisories, coal ash disposal practices have been documented as the source of the elevated selenium. (ALA00292)

Selenium is not routinely tested for by all states in their efforts to decide how and where to warn residents about eating locally caught fish. Of the 13 states with 10 or more surface impoundments, four (Illinois, Kentucky, Pennsylvania and South Carolina - site of the Savannah River Ecology Laboratory) do not include selenium in the suite of pollutants analyzed for when setting fish consumption advisories. In many states where selenium is included in the suite of tested metals, it is only analyzed sporadically. In some cases this is because results from past analyses have not yielded results that show that selenium is found at levels that are a threat to humans. However, because of the lack of uniformity in collection and analysis, it is unclear whether the selenium fish consumption advisories that are in place and are known to be connected with coal waste disposal, represent all the potential fish advisories in the country or whether, with more comprehensive data collection and analysis, there would be more advisories. (ALA00292)

From an ecological perspective, the question that needs to be answered is at what tissue concentrations are fish negatively affected by selenium and what water concentrations yield this fish tissue concentration. There is ample evidence to show that the current water quality criterion of 5 ug/L is not protective enough of ecological systems. In their article, Richard Engberg, Dennis Westcot, Michael Delamore and Delmar D. Holz. (Engberg, et. al 1998 ) argue that the current

water quality criterion, by not taking bioaccumulation into account, is not protective of aquatic systems. (ALA00292)

The tissue concentrations at which selenium can impact humans are likely to be higher than concentrations that affect other organisms and in particular, fish. The National Biological Survey collected and analyzed fish samples for approximately 15 years from the early 70s to mid 80s. While only one fish tissue sample (collected at the site of a fish consumption advisory) had levels above 5 mg/kg wet weight, there were 41 samples, representing five sites where tissue concentrations were above 1 mg/kg wet weight. Are these concentrations that are high enough to harm fish? Dennis Lemly has studied impacts of selenium on fish and has found that excessive selenium can cause a wide variety of toxic effects in fish at the biochemical, cellular, organ and systems level (Lemly, 1998). The most prominent manifestation of the toxic impacts are teratogenic deformities. These deformities are produced in response to dietary exposure of parent fish and subsequent deposition of selenium in eggs. At high enough concentrations, deformed embryos develop as a result of dysfunctional proteins and enzymes. Lemly (1996) refers to field studies that have documented selenium bioaccumulation factors of 500 to 35,000 in aquatic habitats where concentration of waterborne selenium were in the 2 to 16 : g/L range. Because of this high bioaccumulative capacity, Lemly notes that waterborne selenium concentrations of 2 : g/L or higher will be hazardous to the health and long-term survival of fish and wildlife and that under certain environmental conditions, 1 : g/L has the potential to bioaccumulate to concentrations in the food chain that are toxic to predatory species. (ALA00292)

Because of emerging questions of the bioaccumulation factors associated with selenium, EPA's Office of Water is currently conducting a review of the ambient water quality criterion for selenium. According to The Office's Keith Sappington, a draft of the proposed acute water quality criterion is expected in spring of 2000 and a draft of the proposed chronic criterion (the 5pg/L standard) is expected in spring of 2001. Because of the presence of selenium in coal wastes and the presence of selenium in discharge waters of surface impoundments, we would expect the Office of Solid Waste and Emergency Response to be in communication with the Office of Water throughout this review process. The other effort conducted by Office of Water that will be relevant to understanding the ecological impacts of surface impoundments and coal combustion wastes is the three-year Bioaccumulation Study which began summer of 1999. In this study the fish tissues from 1200 lakes over a three year period will be monitored. This will provide important information on the extent to which selenium (and other fossil fuel-related wastes) are bioaccumulating in fish across the country. (ALA00292)

What is clear is that ecological impacts extend beyond the disposal site. With surface impoundments, there is demonstrated evidence that aquatic populations are negatively impacted by the discharge waters from impoundments ... These are serious concerns which make it clear that these wastes should not receive continued exemption from RCRA subtitle C regulations. Any Regulatory Determination should also maintain some flexibility to deal with a changed selenium water quality criterion in 2001. (ALA00292)

## **XVII. ECOLOGICAL RISK ASSESSMENT**

### **C. Pathways Considered**

One public interest group commenter stated that the assessment suffers from not including an analysis of FFC releases on estuarine systems and associated receptors. This commenter also stated that, while the assessment considered only direct contact with surface impoundment waters, research from Ohio and South Carolina shows that the ecological impacts extend beyond the surface impoundment and into the receiving waters. The commenter argued that this research demonstrates that TMDLs under the NPDES program do not adequately protect aquatic life. This commenter and another public interest group commenter expressed concern about the ecological impacts of CCW transported through subsurface pathways. One of these commenters cited research showing that unlined sites will degrade the microbiota of waters beneath disposal sites.

Response: EPA agrees with the commenters' concerns and, in the non-groundwater risk assessment technical background document<sup>3</sup>, pointed out that the exclusion of estuarine systems introduces uncertainty into the ecological risk assessment. In addition, EPA also noted that the failure to include the ground water to surface water pathway may, for some environmental conditions (e.g., high water table), underestimate the potential ecological risks. EPA recognized the exclusion of estuarine systems and the subsurface pathways as limitations of this analysis and provided some perspective on these limitations in the risk characterization. In brief, evaluating estuarine systems would require substantial effort in data collection on estuarine receptors (e.g., ecotoxicity data) as well as in adapting the multimedia modeling construct to simulate the complex environmental behavior of metals in brackish and marine waters of estuaries.

Although exclusion of estuarine systems limits our ability to interpret the risk results, data identified for this analysis do not suggest that these systems and receptors are at greater risk than freshwater systems. Indeed, flocculation of metal salts and competitive binding with chlorine ions acts to mitigate the toxicity of cationic metals.<sup>4</sup> With respect to the subsurface pathways, the limited mobility of most metals (due to binding with FeO<sub>x</sub> and other charged ions) prevents surface water recharge from being an important source of metal contamination. Of those metals that have been shown to impact sediment and surface water through this pathway (e.g., arsenic, boron, nickel), it is unclear whether the subsurface contribution would be distinguishable from the background contribution for a variety of conditions. Nevertheless, the ecological impacts from surface water recharge from contaminated aquifers cannot be determined from the modeling simulations conducted for this analysis.

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<sup>3</sup> FF2P-S0370.

<sup>4</sup> e.g., Benoit, G., S.D. Oktay-Marshall, A. Cantu, II, E.M. Hood, C.H. Coleman, M.O. Corapcioglu, and P.H. Santschi. Partitioning of Cu, Pb, Ag, Zn, Fe, Al, and Mn between Filter-retained Particles, Colloids, and Solution in Six Texas Estuaries. *Marine Chemistry* 5: 307-336. 1994; Hogstrand, C., F. Galvez, and C.M. Wood. Toxicity, Silver Accumulation and Metallothionein Induction in Freshwater Rainbow Trout during Exposure to Different Silver Salts. *Environ. Toxicol. and Chem.* 15(7):1102-1108. 1996.

The direct discharge of water from surface impoundments to receiving waterbodies is regulated by the Office of Water under the NPDES guidelines, and this release scenario is not considered under the purview of RCRA. The Office of Water uses NPDES permits to limit the overall loading of contaminants to waterbodies such that concentrations do not exceed the national or state water quality criteria. Protection of the freshwater community is presumed when surface water concentrations remain below the water quality criteria.

EPA agrees that there may be potential impacts to microbiota in subsurface aquifers that receive leachate from unconfined waste disposal sites. Because this is a potential pathway of concern that was not evaluated, this is considered a limitation of the analysis. It is atypical, however, to consider microbiota in aquifers as a receptor category in ecological risk assessments and the ecological significance of effects to microbiota in this habitat is, as present, unclear.

**XVII. ECOLOGICAL RISK ASSESSMENT**  
**C. Pathways Considered**  
**Verbatim Commenter Statements**

With limited time and resources, we have been able to find evidence that ecological risks from CCW ... are not mostly limited to large surface impoundments ... The cases listed above also show that contamination from CCW transported through subsurface pathways can cause damage to organisms. (HEC00056)

Large surface impoundments are not the only places ecological damage from CCW has resulted. HEC is submitting ten new cases of contamination from CCW along with our comments. Among these cases are two regulated CCW landfills where state agencies found boron contamination from CCW was causing damage to plants. At the CedarSauk Ash Landfill in Wisconsin, groundwater flowing through the site carried boron contamination from CCW to a nearby wetlands. The Wisconsin Department of Natural Resources observing vegetation stress typical of boron contamination in the summers of 1980 and 81. Further research into the problem revealed boron concentrations in leaf tissue to be between 300 and 1600 ppm, and that the source of the boron was the landfill. The company in charge of the landfill was ordered to install three extraction wells to prevent contamination spreading to the wetlands. However, this step did not prove effective, and steps are now being taken to upgrade the landfill cover. In Section 3 (page 36) of the report, EPA states "the subsurface pathway was not evaluated in this analysis....". EPA goes on to state that this may be a concern in areas with high water table such as wetlands and estuaries. Yet, they have not taken the proper to look for and evaluate sites where contamination is traveling via groundwater to these types of ecosystems. At the Coffeen/White and Brewer Trucking Fly Ash Landfill, state regulators found a sizeable area of dead plants located close to the landfill. Further investigation revealed that leachate was seeping out of the landfill. This would again show a groundwater pathway of contamination. Analysis of the seep revealed boron levels at 314 mg/l, over 104 times the USEPA long term health advisory for adults of 3 mg/l and 157 times the general irrigation limit of 2 mg/l, and iron levels at 65.7 mg/l, 219 times the SDWS of .3 mg/l. In addition to the problems associated with the seep, the site was also cited for violating state water standards for sulfates, TDS, and manganese. (HEC00056)

The assessment suffers from not including an anaiysis of FFC releases on estuarine systems and associated receptors. (ALA00036)

Some of the most relevant of the published research reported by RTI is the work on the ecological risks to receiving waters, undertaken at the Savannah River Ecology Laboratory by Rowe, Congdon and Hopkins. We understand that these researchers will be submitting all their published papers as comments to this docket. The relev,ance of this work is extremely important when considering the environmental hazard associated with surface impoundments. While the Report to Congress suggests that the ecological risk associated with surface impoundments occurs to animals

- mostly waterfowl - that come into direct contact with the surface waters, the Savannah River research shows that the ecological impacts extend beyond the surface impoundment and into the receiving waters ... [comment summarizes this research] ... A related study in Ohio (Hatcher et. al 1992) samples lake sediments, macrozoobenthos and fish near a coal ash disposal basin on the western shore of Lake Erie ... [comment summarizes this research] ... The results of this research have serious implications for surface impoundments around the United States. The Report to Congress assumed that the National Pollutant Discharge Elimination System (NPDES) and the setting of the Total Maximum Daily Loads (TMDLs) adequately protected aquatic life in receiving waters. However, this research shows that that is not the case. It shows that ecological damage from surface impoundments has the potential of being a much larger problem. The implication of this research must be taken into consideration when making the final Regulatory Determination. (ALA00292)

Not all ecological impacts are associated with surface impoundments. There are ecological risks to consider from long-term, above ground disposal as well. Many of these risks are described by other commenters and regard the extent by which water movement from disposal sites will contaminate aquifers. Brunning, et. al. ( 1994) analyzed whether polluted waters will infiltrate into aquifers from alkaline coal combustion waste sites and whether the infiltration of these waters will affect the microbiology of the aquifer. The answer to both these questions were yes. The study demonstrated the formation of toxic leachate with high pH, alkalinity and concentrations of  $\text{Ca}^{2-}$  and  $\text{SO}_2^{2-}$  well above drinking water standards. While the lime reduced the mobility of some metals, arsenic and strontium and elevated pH contributed to toxic effects on the microbiota of the aquifer. This research shows that any disposal method that does not have a proven confinement will result in ecological impacts to the saturated zone beneath the disposal site. (ALA00292)

What is clear is that ecological impacts extend beyond the disposal site. With surface impoundments, there is demonstrated evidence that aquatic populations are negatively impacted by the discharge waters from impoundments. In addition, there is data showing that unlined sites will degrade the microbiota of waters beneath disposal sites. (ALA00292)





### **XVIII. RISK CHARACTERIZATION**

Various commenters addressed EPA's overall characterization of risk as portrayed in the RTC, given its modeling results, damage cases, state programs and other factors. Public interest group commenters stated that EPA's conclusions as stated in the RTC regarding risk were not supported by its modeling results and that the Agency reached its conclusions without sufficient consideration of damage cases, risks to children, population risks, or cumulative and simultaneous exposures. Industry and academic commenters stated that EPA had not appropriately tempered its conclusions about risk with empirical observations and consideration of current management practices. In sum, EPA's risk characterization was criticized from both sides, but for different reasons.

Specific comments are addressed following this overall response. In some cases, as in earlier sections of the responses, we respond simply to clear up certain technical points. The agency reiterates that groundwater risk modeling was not part of the rationale for today's rulemaking, even though certain groundwater model related comments are addressed below as in foregoing sections.

Response: In the Report to Congress, EPA presented its risk modeling results as a characterization of the high-end potential risks from management of FFC wastes in unlined units. The Agency then characterized modeled risk based on the best available information about model uncertainties and other factors such as time to risk and risks to children. The overall characterization also included careful consideration of documented cases of damages to human health and the environment (see Topic XIX), current management controls and the adequacy of state programs. As noted, as the result of comments the Agency is also conducting a thorough reassessment of EPACMTP, the model used for the groundwater risk assessment. As a result, the Agency is not relying on the ground-water risk assessment for today's regulatory determination. After consideration of all comments, EPA now believes that these wastes may pose risks to human health and the environment when not properly managed, and that there is sufficient evidence that adequate controls may not be in place for a significant number of facilities.

New information received by EPA in public comments includes additional documented damage cases, as well as cases indicating at least a potential for damage to human health and the environment. While the absolute number of documented damage cases is not large, EPA believes that the evidence of proven and potential damage is significant when considered in light of the large numbers of facilities, particularly surface impoundments, that today lack basic environmental controls such as liners and groundwater monitoring. EPA acknowledges, moreover, that its inquiry into the existence of damage cases was focused primarily on a subset of states. Given the huge volume of coal combustion wastes generated nationwide and the numbers of facilities that currently lack some basic environmental controls, especially groundwater monitoring, there is at least a substantial likelihood that other cases of proven and potential damage exist.

Since the Report to Congress, EPA has also conducted additional analyses of the potential for the constituents of coal combustion wastes to leach in dangerous levels into groundwater. Based on a comparison of drinking water and other appropriate standards to leach test data from coal combustion waste samples, we identified a potential for significant risks from arsenic that we cannot dismiss at this time.

EPA acknowledges that, even without federal regulatory action, many facilities in the industry have either voluntarily instituted adequate environmental controls or have done so at the direction of states that regulate these facilities. However, in light of the evidence of actual and potential damage to human health or the environment from these wastes, the sheer volume of wastes generated from coal combustion, the significant numbers of facilities that do not currently have basic controls in place, and the composition of these wastes, EPA believes that, on balance, the best means of ensuring that adequate controls are imposed where needed is to develop tailored regulations under Subtitle D of RCRA.

While the Agency is making a final decision pursuant to 42 U.S.C. § 3001(b)(3)(C) regarding these wastes, EPA acknowledges our decision is a departure from the approach described in the Report to Congress, and we are providing the public an opportunity to comment on today's determination. We will consider these comments in either developing regulations under Subtitle D or revisiting and, if appropriate, revising today's determination.

Certain of the responses below address specific concerns raised by commenters on this topic in more detail, for clarification purposes, even though the Agency has now determined that regulation is warranted.

## **XVIII. RISK CHARACTERIZATION**

### **Verbatim Commenter Statements**

The inconsistent application of EPA's risk assessment methods and policies seriously jeopardizes the use of the findings in the Report for decision-making regarding the appropriate regulatory status of comanaged FFC waste. (ALA00036)

EPA declares in its Executive Summary, Section 3 page 6, that large surface impoundments can theoretically pose risks to birds, mammals, and amphibians. EPA discounts the idea of taking any action to reduce the risks posed by large surface impoundments on two factors, there is no information on the actual ecological risks posed by large surface impoundments and the cost of eliminating such impoundments is too high. Both of these statements are completely unsubstantiated. (HEC00056)

The substantial data gaps in the Report suggest that the resulting depiction of risks is incorrect. (49CAO00058)

The Report is out of sync with agency policies and priorities. (49CAO00058)

But EPA's own analysis in the Report, as discussed below, shows that the comanaged wastes raise serious human health and ecological risks -- risks that the Agency disregards in reaching its Draft Regulatory Determination not to require RCRA regulation for these wastes. (ALA00292)

We strongly disagree with EPA's over reliance on modeling as a risk assessment tool. EPA has ample real world data on utility combustion wastes, and often these data fail to confirm the conclusions generated by the model. (USWAG00037)

EPA Failed to consider the prevalence of liners in the landfill scenario. (USWAG00037)

The limited number of actual case studies at mines where groundwater monitoring is performed in a meaningful way jeopardizes the credibility of the study. The report and appendices appear to apologize for this shortcoming. The modeling review often appears to "wish" there were more opportunities for model testing by comparison with real data [Section 3-4, for example]. The limits of the effort seem to be due to the crunch of time, which is unfortunate. The case study limitation is true in Texas, but here there are a number of municipal and C&D landfill situations in similar settings that could serve as surrogates. The comment here is that modeling conclusions should await an effort to gather real data from case studies for comparison with EPACMPT results. (RICE00041)

USWAG comments provide detailed, technical information demonstrating the risks are overstated by several orders of magnitude. Reiteration of the technical arguments is unnecessary. However,

APS strongly agrees with USWAG's position that ... use of modeling is inappropriate when actual field data was made available to the agency. (APSC00043)

On page 3-3 it was stated that "for arsenic the (cancer) risk for young children increased roughly 25 percent compared to the adult receptors." Care must be exercised when using this sort of a comparison. For example, a recent article in *Issues in Science and Technology* pointed out that the way many of the reported increases in childhood cancer are presented may be somewhat misleading. A reported increase of over 40 percent in the annual incidence of kidney and renal pelvis cancer from 1973-74 to 1993-94 actually represents an increase from 0.7 to 1.0 cases per 100,000 children. In 1994-1995, the rate was 0.8 per 100,000, which is an increase of over 14 percent, but represents an increase of 1 additional case per million children. It must be kept in perspective that cancer in children is a relatively rare event (Huebner and Chilton, 1998). (EERC00044)

In general terms, CIBO points out that real-life data and experience are far superior to modeled projections. Modeling, no matter how good, cannot account for all the variables in geology, hydrology, meteorology, and other flaws. Because of their limitations, environmental models (including risk assessment models) quite often substantially overstate real-world exposure and risks. (CIBO00052)

The modeling did not account for the current ash management practice of spreading and compacting in thin layers to maximize the structural integrity of the fill. (CIBO00052)

Modeled predictions are no substitute for actual data, as EPA states in the Report ... Fortunately, there is considerable monitoring data ... and PG&E Gen respectfully asks that it be given due consideration by EPA. (PG&E00274)

USWAG's initial comments, combined with the wealth of field data in the record, provide the basis for EPA to reevaluate its modeling exercise, reduce its risk estimates by orders of magnitude, and validate those results. (USWAG00275)

EPA's regulatory determination must be made based upon the totality of the available information with full respect for the real world data and conditions. (USWAG00275)

In light of significant criticism by other commenters of EPA's risk assessment, CIBO reiterates its earlier recommendation that EPA rely on field data carefully compiled and submitted to the Agency in ample time for its consideration. (CIBO00280)

## **XVIII. RISK CHARACTERIZATION**

### **A. Modeling versus Empirical Observation**

Industry and academic commenters stated that the use of modeling is inappropriate because significant observational data exist to characterize the fate and transport of waste constituents. The commenters suggested that EPA rely on these data rather than modeling to characterize risk, or at the least use these data to validate the model results.

Response: As noted in prior sections of these responses, EPA is not using risk modeling at this time as a component of its characterization of risk. The Agency is basing its characterization of risk on consideration of other factors. Among the factors considered were EPA's review of documented cases of human health and environmental damage (see Topic XIX) and its review of state programs. The Agency believes this consideration of empirical data in its risk characterization was appropriate and adequate. EPA plans to continue to use risk modeling as a component of overall risk assessment, and, as noted, is currently reviewing the groundwater model used. The Agency notes that the use of empirical data, in many cases, cannot typically substitute entirely for risk modeling because of concerns relative to the question of long term mobility.

**XVIII. RISK CHARACTERIZATION**  
**A. Modeling versus Empirical Observation**  
**Verbatim Commenter Statements**

We strongly disagree with EPA's over reliance on modeling as a risk assessment tool. EPA has ample real world data on utility combustion wastes, and often these data fail to confirm the conclusions generated by the model. (USWAG00037)

EPA should utilize the wealth of real world data to the fullest extent possible (USWAG00037)

EPA should validate its modeling results by comparison with real world data. (USWAG00037)

Use of CMTF is inappropriate where significant observational data is available. USWAG and EPRI provided EPA with a wealth of data that were collected and analyzed in close cooperation with the Agency over a period of 18 years. These data were and remain the most comprehensive data available regarding the variability of the waste characteristics resulting from various waste combinations, management practices, geologic, and climatic differences ... Unfortunately, EPA disregarded that wealth of data and erroneously extracted only input values for modeling fate and transport of the constituents. USWAG urges EPA once again to utilize the data that present a clear picture of the fate and transport of these constituents rather than relying upon a questionable mathematical construct. (USWAG00037)

While the breadth and diversity of the "remaining waste" universe preclude collection of sufficient site-specific data to completely characterize risk to human health of the entire waste universe under the full range of management possibilities, we cannot support EPA's decision to use modeling as a surrogate for actual field data ... Certainly where there are gaps in the data, modeling may play an appropriate role in risk assessment; however, we fear that the Agency has become a prisoner of its models. It is almost as though EPA would rather generate numbers from its computers than see what in fact is occurring in the environment. Modeling is not an adequate substitute for the painstaking work of assembling and analyzing readily available facts. The valuable field data EPRI has collected and transmitted to EPA have been used ineffectively. (USWAG00037)

As we discuss below, where the field data demonstrate that the model's assumptions are unrealistic, EPA is obliged both from scientific and legal perspectives to reassess and appropriately adjust its modeling methodology. As a matter of law, "[a]n agency's use of a model is arbitrary if that model bears no rational relationship to the reality it purports to represent. Furthermore, EPA retains a duty to examine key assumptions as part of its affirmative burden of promulgating and explaining a non-arbitrary, non-capricious rule." (USWAG00037)

The limited number of actual case studies at mines where groundwater monitoring is performed in a meaningful way jeopardizes the credibility of the study. The report and appendices appear to apologize for this shortcoming. The modeling review often appears to “wish” there were more opportunities for model testing by comparison with real data [Section 3-4, for example]. The limits of the effort seem to be due to the crunch of time, which is unfortunate. The case study limitation is true in Texas, but here there are a number of municipal and C&D landfill situations in similar settings that could serve as surrogates. The comment here is that modeling conclusions should await an effort to gather real data from case studies for comparison with EPACMPT results. (RICE00041)

USWAG comments provide detailed, technical information demonstrating the risks are overstated by several orders of magnitude. Reiteration of the technical arguments is unnecessary. However, APS strongly agrees with USWAG’s position that ... use of modeling is inappropriate when actual field data was made available to the agency. (APSC00043)

In general terms, CIBO points out that real-life data and experience are far superior to modeled projections. Modeling, no matter how good, cannot account for all the variables in geology, hydrology, meteorology, and other flaws. Because of their limitations, environmental models (including risk assessment models) quite often substantially overstate real-world exposure and risks. (CIBO00052)

Given this wide range of known inaccuracies in modeling, CIBO questions whether EPA should rely so heavily on these models when making important decisions in this rulemaking. This concern is highlighted by the fact that CIBO and other commenters have submitted thorough data and analyses on which to base a real-world decision, obviating the need for admittedly flawed modeling. (CIBO00052)

Modeled predictions are no substitute for actual data, as EPA states in the Report, especially with FBC coal ash, which is a mixture of materials, applied to the land in varying soils and complex geology. Fortunately, there is considerable monitoring data from actual reclamation and soil amendment uses of this coal ash, which have been provided to EPA for review by industry, academia and by state agencies currently regulating those beneficial uses. This information necessarily takes into account the complex interactions, that elude the model, and PG&E Gen respectfully asks that it be given due consideration by EPA. (PG&E00274)

USWAG’s initial comments, combined with the wealth of field data in the record, provide the basis for EPA to reevaluate its modeling exercise, reduce its risk estimates by orders of magnitude, and validate those results. (USWAG00275)

EPA’s regulatory determination must be made based upon the totality of the available information with full respect for the real world data and conditions. (USWAG00275)

As a matter of sound science, EPA is obligated to reassess and appropriately adjust its modeling methodology to correspond to real world data. As a matter of law, “[a]n agency’s use of a model is arbitrary if that model bears no rational relationship to the reality it purports to represent. Furthermore, EPA retains a duty to examine key assumptions as part of its affirmative burden of promulgating and explaining a non-arbitrary, non-capricious rule.” (USWAG00275)

As should be expected, the models do not provide the ultimate answers to the many issues presented. If EPA is asked whether it is raining, the best answer can be found by looking out the window, not by turning on the computer. Similarly, EPA’s regulatory determination should give full weight to what can readily be seen at FFC waste management sites, not the imperfect science of computer models. (USWAG00275)

In light of significant criticism by other commenters of EPA’s risk assessment, CIBO reiterates its earlier recommendation that EPA rely on field data carefully compiled and submitted to the Agency in ample time for its consideration. (CIBO00280)



## **XVIII. RISK CHARACTERIZATION**

### **B. Risk Conclusions Inconsistent with Assessment Results**

Several public interest group commenters stated that EPA's RTC conclusion that FFC wastes do not present risks to human health and the environment was inconsistent with the results of the risk modeling assessment, which found risks in excess of EPA's criteria. Some of the commenters were concerned that EPA had dismissed its conclusions about ecological risk from surface impoundments because of a lack of information and the costs of regulation. One of the commenters was concerned that EPA was dismissing arsenic risks by comparing them to background arsenic levels without providing any data on background arsenic. Other conclusions of particular concern were those regarding agricultural use (see Topic VIII) and risks to children (see topic XVIII.D).

Response: EPA is not relying on its ground water risk modeling results for this regulatory determination action. Nonetheless, certain key risk modeling comments are addressed below for clarification.

In response to commenters' characterization of EPA analysis predicting cancer risks for children from arsenic-contaminated drinking water as high as one in one hundred, this statement arises from an obvious misinterpretation of information in background documents and in the RTC. Risk analyses began with a "screening" evaluation. These screening analyses typically address ingestion of a chemical at the source, often as generated. This is not a reasonable basis for concluding that exposure risk exists.

If we determine in screening analyses that a risk should be transport modeled, we conduct such modeling to better predict exposure. No modeled risk of one in one hundred was reported.

While not relying on the EPACMTP groundwater modeling as presented in the RTC, we have since conducted a general comparison of the metals levels in leachate from coal combustion wastes to their corresponding hazardous waste toxicity characteristic levels. Fossil fuel wastes infrequently exceed the hazardous waste characteristic. For co-managed wastes, 2% (1 of 51 samples) exceeded the characteristic level. For individual wastes streams, 0% of the coal bottom ash, 2% of the coal fly ash, 3% of the coal flue gas desulfurization, and 7% of the coal boiler slag samples that were tested exceeded the characteristic level. Nevertheless, once we have completed a review of our groundwater model and made any necessary changes, we will reevaluate groundwater risks and take appropriate regulatory actions. We will specifically assess new modeling results as they relate to any promulgated changes in the arsenic MCL.

We also compared leach concentrations from fossil fuel wastes to the drinking water MCLs. In the case of arsenic, we examined a range of values because EPA expects to promulgate a new arsenic drinking water regulation by January 1, 2001. This range includes the existing arsenic MCL (50 ug/l), a lower health based number presented in the FFC Report to Congress

(RTC) (0.29 ug/l), and two assumed values in between (10 and 5 ug/l). We examined this range of values because of our desire to bracket the likely range of values that EPA will be considering in its effort to revise the current MCL for arsenic. The National Research Council's 1999 report on *Arsenic in Drinking Water* indicated that the current MCL is not sufficiently protective and should be revised downward as soon as possible. For this reason, we selected the current MCL of 50 ug/L for the high end of the range because EPA is now considering lowering the current MCL and does not anticipate that the current MCL would be revised to any higher value. We selected the health-based number presented in the Report to Congress for the low end of the range because we believe this represents the lowest concentration that would be considered in revising the current MCL. Because at this time we cannot project a particular value as the eventual MCL, we also examined values in between these low-end and high-end values, a value of 5 ug/L and a value of 10 ug/L, for our analyses supporting today's regulatory determination. The choice of these mid-range values for analyses does not predetermine the final MCL for arsenic.

Those circumstances where the leach concentrations from the wastes exceed the drinking water criteria have the greatest potential to cause significant risks. This "potential" risk, however, may not occur at actual facilities. Pollutants in the leachate of the wastes undergo dilution and attenuation as they migrate through the ground. The primary purpose of models such as EPACMTP is to account for the degree of dilution and attenuation that is likely to occur, and to obtain a realistic estimate of the concentration of contaminants at a groundwater receptor. To provide a view of potential groundwater risk, we tabulated the number of occurrences where the waste leachate hazardous metals concentrations were: (a) less than the criteria, (b) between 1 and 10 times the criteria, (c) between 10 and 100 times the criteria, and (d) greater than 100 times the criteria. Groundwater models that we currently use, when applied to large volume monofill sources of metals, frequently predict that dilution and attenuation will reduce leachate levels on the order of a factor of 10 under reasonable high end conditions. This multiple is commonly called a dilution and attenuation factor (DAF). For this reason and because lower dilution and attenuation factors (e.g., 10) are often associated with larger disposal units such as those typical at facilities where coal is burned, we assessed the frequency of occurrence of leach concentrations for various hazardous metals which were greater than 10 times the drinking water criteria. Based on current MCLs, there was only one exceedence (for cadmium). However, when we considered the arsenic health based criterion from the RTC, we found that a significant percentage (86%) of available waste samples had leach concentrations for arsenic that were greater than ten times the health-based criterion. Even considering intermediate values closer to the current MCL, a significant percentage of available waste samples had leach concentrations for arsenic that were greater than ten times the criteria (30% when the criterion was assumed to be 5 ug/l, and 14% when the criterion was assumed to be 10 ug/l). Similar concerns also occurred when comparing actual groundwater samples associated with FFC waste units and this range of criteria for arsenic. We believe this is an indication of potential risks from arsenic.

**XVIII. RISK CHARACTERIZATION**  
**B. Risk Conclusions Inconsistent with Assessment Results**  
**Verbatim Commenter Statements**

One of the most serious inconsistencies in the Report is in regard to EPA's risk characterization policies that identify risks above a one-in-one million ( $1 \times 10^{-6}$ ) for carcinogens and a hazard quotient of 1 for non-carcinogens as potentially hazardous to public health. In the Report, EPA concludes that FFC wastes "do not present risks to human health and the environment" despite the fact that the risks are consistently above acceptable levels for coal-, oil- and FBC combustion waste. The incremental risks (i.e. risks from exposure to FFC wastes only) are, in fact, as low as one-in-one hundred for children potentially exposed to contaminated groundwater from coal-fired combustion wastes. The only scenarios for which no public health risks were reported are associated with natural gas combustion since no wastes are generated. (ALA00036)

Contrary to the findings of the risk assessments, EPA has determined that agricultural use of coal-fired and FBC utility combustion wastes poses a public health risk and, therefore, should be considered for regulation. This is despite the fact that no unacceptable risk (i.e. greater than  $1 \times 10^{-6}$  or  $HQ > 1$ ) for the agricultural soil amendment scenario were reported. On the other hand, risks for all other scenarios exceeded acceptable levels, but EPA concludes that there "is a lack of potential human health risks for virtually all waste constituents." This is simply not true. (ALA00036)

There are several assumptions and uncertainties in the risk assessments that could underestimate the risk estimates cited in the Report. These uncertainties, in conjunction with the disconnect between the findings of human health risks and EPA recommendations that address those scenarios where risks were not found, suggest that there is insufficient basis for applying the conclusions drawn from the risk characterization in any subsequent Regulatory Determinations made regarding FFC wastes. (ALA00036)

EPA's analysis focuses exclusively on incremental risks from FFC wastes. True risks are likely higher especially for metals which bioaccumulate in food or have a variety of anthropogenic and natural sources. Although EPA did not evaluate background concentrations or even mention the issue, it did conclude that "natural As levels have the potential to pose higher risks than non-groundwater pathways." What is the basis for EPA's conclusion? There is not background data on any of the metals evaluated in the risk assessments. The statement suggests a bias by EPA to dismiss impacts despite unacceptable risk levels. (ALA00036)

The Agency proposes to exempt coal wastes from Subtitle C despite identifying ecological risks from coal combustion wastes managed in impoundments ... The Agency appears to be proposing to exempt these wastes simply because it is difficult to address the ecological impacts. This action has no basis in RCRA. (ALA00036)

Despite the potential to underestimate risks, EPA reports risk levels in the range of one in one-hundred to one in ten-thousand for a known human carcinogen (arsenic), but concluded “that wastes do not pose human health risks” ... With regard to non-groundwater risks, EPA simply ignores its own findings of risks exceeding acceptable levels, especially for children. (ALA00036)

EPA declares in its Executive Summary, Section 3 page 6, that large surface impoundments can theoretically pose risks to birds, mammals, and amphibians. EPA discounts the idea of taking any action to reduce the risks posed by large surface impoundments on two factors, there is no information on the actual ecological risks posed by large surface impoundments and the cost of eliminating such impoundments is too high. Both of these statements are completely unsubstantiated. (HEC00056)

The Report identifies potential ecological risks associated with coal combustion wastes, but then declares that no documented impact information was available to compare with the risk modeling results. (49CAO00058)

The Report suggests cancer risks to children from coal waste management facilities that are orders of magnitude higher than unacceptable/action level risks under these policies -- and yet these results do not appear to factor into the Agency's conclusions that the wastes do not require Subtitle C regulation. (49CAO00058)

In at least one instance, the Report seemingly ignores high levels of cancer risks to children--the risk of cancer from exposure to arsenic from coal waste landfills of 1.3 per 100 in concluding that FFC wastes do not require subtitle C regulation. (49CA00058)

EPA reports, but ignores (in its conclusions and draft Regulatory Determination) extremely high potential cancer risks -- 1 in 100 to 1 in 1000 -- to children of exposure to arsenic in co-managed coal waste-contaminated groundwater. EPA similarly disregards reported relatively high cancer risks associated with exposure of adults to groundwater contaminated with FFC waste constituents. (ALA00292)

But EPA's own analysis in the Report, as discussed below., shows that the comanaged wastes raise serious human health and ecological risks -- risks that the Agency disregards in reaching its Draft Regulatory Determination not to require RCRA regulation for these wastes. (ALA00292)

Our consultants also found that EPA seemingly disregarded reported high human health and ecological risks of current FFC waste disposal practices in reaching its draft Regulatory Determination -- which is, at the least inconsistent with Agency policy, and at worst a disregard for the actual damage that could be caused to human health and the environment from a continued and permanent exemption of these wastes. (ALA00292)

EPA's disregard of reported high risks associated with groundwater pathway is inconsistent with Agency policy. It is EPA policy that cancer risks exceeding one-in-one-million and non-cancer risks exceeding a hazard quotient of 1 are considered potential public health concern. As shown in Table 7 below the risks for coal-, oil- and FBC-generated wastes exceed acceptable risk benchmarks for cancer; oil waste also exceeds the non-cancer benchmarks. Based on the results of the ground water risk assessment presented in the Report to Congress it appears that the EPA incorrectly concluded that "no significant risks to human health and the environment were identified or believed to exist." (ALA00292)

Furthermore, while the non-groundwater risk assessment does not identify any significant risks due to application of fluidized bed combustion (FBC) wastes to agricultural land, the draft Report to Congress does identify arsenic concentrations as a potential concern for this waste and other types of waste (e.g., coal combustion waste -- CCW) in this application. (ALA00292)

## **XVIII. RISK CHARACTERIZATION**

### **C. Failure to Address Persistent Bioaccumulative Toxics Appropriately**

Public interest group commenters stated that, given the Agency's stated goals in the Persistent Bioaccumulative Toxics strategy, EPA failed to address the following in its consideration of risk: a cohesive and coherent control strategy to reduce the overall releases of mercury, arsenic, and nickel; cross-media releases of mercury; consideration of groups of pollutants rather than individual pollutants; and methods to avoid transferring problems across media or to chemical substitute.

Response: EPA believes it has adequately addressed these issues as today's decision indicates, within the bounds of the statutory guidelines for this study and the state of risk assessment science. EPA is also planning to consider the ongoing effort to further restrict air emissions as these impact on solid wastes, as noted elsewhere in these responses to comment.

**XVIII. RISK CHARACTERIZATION**  
**C. Failure to Address Persistent Bioaccumulative Toxics Appropriately**  
**Verbatim Commenter Statements**

Despite the conclusion that mercury is “screened out” of the analysis based on TCLP results, the concentrations measured (even when the median values are taken) reveal that nationally, tons of mercury are being mobilized in these waste disposal sites. The lack of consideration given to mercury releases runs counter to the Administrator’s PBT strategy. (ALA00036)

These uses should be considered particularly from the standpoint of cross-media releases of mercury. For example, FBC sludge use for cement manufacturing will certainly release mercury to the environment. A true life-cycle analysis of these wastes and their end uses should be conducted. (ALA00036)

The Agency’s stated goal under the Persistent Bioaccumulative Toxics (PBT) Strategy is “reducing risk to human health in the environment from existing and future exposure to priority persistent, bioaccumulative and toxic pollutants.” By proposing to exempt FFC wastes from Subtitle C, the Agency fails to consider the goals of the PBT strategy. (ALA00036)

The PBT strategy emphasizes a multi-media approach and commits the Agency to coordinating Agency actions across programs. The Report fails to coordinate across Agency programs. For example, in 1998 the Agency characterized air emissions from the stacks of power plants and found mercury, arsenic and nickel to be pollutants “of potential concern.” While the Report indicates clear risks from arsenic and nickel, the Agency makes no attempt to link the findings made by two different EPA offices in such a way as to present cohesive and coherent control strategy to reduce the overall releases of these pollutants. (ALA00036)

In an April 9, 1999 memorandum concerning the PBT strategy, Administrator Browner emphasizes, as one of her priorities, the need to control mercury releases and the importance of using the Agency’s full complement of tools to do so. The Report fails to address cross-media releases of mercury. Mercury, supposedly one of the Agency’s top concerns, was identified by the Utility Hazardous Air Pollutant Report to Congress as the pollutant of greatest concern from the stack emissions of power plants. In this Report, mercury was given so little consideration that the wastes themselves were not even analyzed for this metal. In addition, the volatilization of mercury from combustion wastes, the most important pathway for mercury releases from wastes, was ignored. This haphazard and incomplete assessment of pollution from power plants is completely out of sync with Administrator Browner’s stated policies and priorities. (ALA00036)

The PBT strategy states as a goal: “Whenever possible, EPA will address groups of pollutants rather than individual pollutants. to prevent or reduce risks from multiple pollutants at the same

time. ” The Report fails to address this goal. A number of PBTs leach and volatilize from FFC wastes. These include mercury, arsenic, nickel, selenium, and vanadium. In addition to mercury, other metals also have the potential to bioaccumulate in the food chain to levels that are toxic to humans and wildlife. There is little or no recourse to mitigate exposure to toxic chemicals once they have contaminated food and water. Therefore, EPA must require adequate and appropriate disposal of FFC wastes to address the PBT strategy element intended to prevent the release of toxic metals to our environment. (ALA00036)

The PBT strategy states as a goal: “Maximizing opportunities for integration will avoid transferring problems across media or to chemical substitutes. ” The Report fails to address this goal. An equal focus must be placed on all releases. For the fossil fuel burning sector, this should include a holistic examination of air emissions and water discharges, as well as coal washing wastes, FFC wastes and all beneficial uses (e.g., cement manufacturing and wallboard manufacturing). Failure to account for all releases from an industry succeeds only in rearranging the contamination rather than controlling or preventing it. (ALA00036)

The Report appears to run counter to the Administrator's ... Persistent Bioaccumulative Toxics (PBT) Strategy. The PBT Strategy emphasizes a multi-media approach and commits the Agency to coordinating Agency actions across programs. The Report, however, fails to address cross-media mercury releases. (49CAO00058)



**XVIII. RISK CHARACTERIZATION**  
**D. Consideration of Risks to Children**

Public interest group commenters argued that the risk characterization paid inadequate attention to risk to children, particularly given Agency policy and Executive Orders regarding risks to children. The commenters expressed concern that the Agency did not consider simultaneous exposures to children and cumulative or additive risks to children. One academic commenter stated that care must be exercised in presenting results of cancer risk assessment for children.

Response: As noted under Topic XIV.D, risks to children were explicitly considered by testing the impact of all variables of special impact on children's risk. EPA found that risks to children were occasionally higher than risks to adults, but within the same order of magnitude. The primary reason for this is that sensitive populations are specifically taken into account for many exposure assumptions.

**XVIII. RISK CHARACTERIZATION**  
**D. Consideration of Risks to Children**  
**Verbatim Commenter Statements**

As indicated in the peer review comments, the risk assessment of children appears to be tacked on the end of the background document. In addition, EPA does not indicate in any of their discussions regarding the exemption of FFC wastes that the highest risks from exposure are to children. This is inconsistent with not only EPA risk assessment guidelines intended to protect sensitive populations but EPA's recent emphasis on protecting children from the potentially lifetime exposures to toxic chemicals. (ALA00036)

EPA does not account for the potential for child cancer risks from ingestion of arsenic to rise by a factor of nine when waste concentration is set at the high-end value, as determined in the sensitivity analysis. (ALA00036)

The Report is counter to the Agency's stated policies concerning risks to children. The EPA's National Agenda to Protect Children's Health from Environmental Threats was developed in recognition that children are more highly exposed to environmental toxins and may be more susceptible to them during pre-natal development and childhood. As one of the seven steps of the Agenda, the Agency commits to "ensure as a matter of national policy, that all standards EPA sets are protective enough to address the potentially heightened risk faced by children . . . so as to prevent environmental health threats where possible . . ." In the Report, despite using an extremely unconservative (central tendency) analysis (discussed above under comments addressing the risk assessment), the Agency still finds risks to children from groundwater ingestion that exceed health thresholds for antimony, arsenic, barium, beryllium, cadmium, chromium, nickel, selenium, and vanadium. Some of the risk projections are orders of magnitude higher than what the Agency has typically considered action levels. Yet, these results do not appear to factor into the Agency's tentative conclusions that Subtitle C is inappropriate to address these "limited" human health problems. (ALA00036)

Another step in the Agenda instructs the Agency to "develop new comprehensive policies to address cumulative and simultaneous exposures faced by children." The Report fails this aspect of the Agenda. First, simultaneous exposures are not even considered given that the groundwater analysis and the above ground multipathway assessment are not coordinated with respect to timing of exposure (the exposures are essentially sequential rather than simultaneous). Second, the risk assessment does not consider cumulative or additive risks to children (or any other receptor). (ALA00036)

The Report appears to run counter to the Administrator's ... Policy on Evaluating Health Risks to Children, and the National Agenda to Protect Children's Health from Environmental Threats. The Report suggests cancer risks to children from coal waste management facilities that are orders of

magnitude higher than unacceptable/action level risks under these policies -- and yet these results do not appear to factor into the Agency's conclusions that the wastes do not require Subtitle C regulation. (49CAO00058)

Although the risks calculated to children range from 1 in 100 to 1 in 1000 for arsenic, EPA has categorically ignored these risks in the Report to Congress. The Agency has prioritized the need to consider the risks to infants and children "consistently and explicitly as a part of risk assessments generated during its decision making process, including the setting of standards to protect public health and the environment." (EPA, 1997) EPA established the need to consider children because of the likelihood that children are more susceptible to the exposure to environmental contaminants that may affect their growth and development. Therefore, EPA's omission of children's risk in the risk characterization without any rationale or justification represents another inconsistency with Agency policy. It is not sufficient to just report risks ~ especially if they are as high as 1 in 100 to children. EPA needs to incorporate the risks associated with exposure of children to FFC waste contaminated ground water into the regulatory decision-making process. (ALA00292)

On page 3-3 it was stated that "for arsenic the (cancer) risk for young children increased roughly 25 percent compared to the adult receptors." Care must be exercised when using this sort of a comparison. For example, a recent article in *Issues in Science and Technology* pointed out that the way many of the reported increases in childhood cancer are presented may be somewhat misleading. A reported increase of over 40 percent in the annual incidence of kidney and renal pelvis cancer from 1973-74 to 1993-94 actually represents an increase from 0.7 to 1.0 cases per 100,000 children. In 1994-1995, the rate was 0.8 per 100,000, which is an increase of over 14 percent, but represents an increase of 1 additional case per million children. It must be kept in perspective that cancer in children is a relatively rare event (Huebner and Chilton, 1998). (EERC00044)

## **XVIII. RISK CHARACTERIZATION**

### **E. Population Risks**

Public interest group commenters stated that, while data on demographics were presented in Technical Background Documents, EPA did not adequately characterize population risks or comply with EPA guidelines on characterizing population risk.

Response: This is a frequent comment in risk assessments. Whether or not population risk needs to be specifically calculated is a clear function of risk levels and population proximity. It is important to bear in mind modeled double high-end risks were calculated at very close distances (150 meters to receptor wells in the case of ground water and 75 meters to receptor in the case of air releases). While there are indeed individuals in close proximity to waste units, there are very few as close as 150/75 meters. Thus very few individuals would be exposed at the risk levels calculated, if available demographics are accurate. At more likely distances, with more population exposure, risk would drop off dramatically. Such reasoning does not in any way diminish the risk to those exposed at the close proximities noted.

**XVIII. RISK CHARACTERIZATION**  
**E. Population Risks**  
**Verbatim Commenter Statements**

There is no information on the population potentially affected by the leaching of chemicals from the waste into groundwater or drinking water sources. An appendix with information was provided in the Report but not integrated into the analysis. The FFC waste risk assessment does not comply with EPA risk assessment guidelines in providing probabilistic number of cases, estimated percentage of population with risk greater than some level, and information about the distribution of exposure and risk for different subgroups of the population. (ALA00036)

While there is individual health risk data reported, the Report did not identify potentially impacted communities, nor did it present community exposure analyses. (49CAO00058)

The Report does not include any assessment of the community health risk in areas near the waste management facilities. (49CAO00058)

EPA did not characterize the risks according to probabilistic number of cases, estimated percentage of population at risk or risk distribution. (ALA00292)

## **XVIII. RISK CHARACTERIZATION**

### **F. Liners in Population**

Industry commenters stated that EPA should have tempered its characterization of risk using information on the actual waste management practices used by the industry. One of the commenters argued that EPA failed to consider the prevalence of liners in the landfill scenario and should have used 85<sup>th</sup> percentile concentrations as modeling input to account for the presence of liners. Another commenter suggested that the modeling did not account for the current ash management practice of spreading and compacting in thin layers to maximize the structural integrity of the fill.

Response: EPA modeled unlined units purposely, in order to produce a consistent and conservative baseline (erring on the side of safety) estimate of risk. The Agency then considered current management practices (e.g., the prevalence of liners, and practices such as leachate collection and groundwater monitoring) explicitly as important factors in reaching its conclusion about the need for regulation. We find that, among utilities, 20% of landfills and 5% of impoundments appear to have adequate liners. This was explicitly taken into account in costing.

**XVIII. RISK CHARACTERIZATION**  
**F. Liners in Population**  
**Verbatim Commenter Statements**

EPA failed to consider the prevalence of liners in the landfill scenario. EPA assumed that all landfills are unlined, whereas the RTC reported that 57% of the landfills represented by EPRI's data are lined. A high-end (95<sup>th</sup> percentile) value from the field data actually represents the 98<sup>th</sup> percentile of all sites due to this overly conservative assumption. The Agency should have either explicitly taken into account the presence of liners in landfills or used the 85<sup>th</sup> percentile values as the high-end bounding estimates. This justified reduction in the imbedded conservatism would have resulted in significant reduction in the calculated risks at receptors over the 10,000 year study period. (USWAG00037)

The modeling did not account for the current ash management practice of spreading and compacting in thin layers to maximize the structural integrity of the fill. (CIBO00052)

EPA's determination should be informed not only by the data from the real world, but by the actual waste management practices employed by the industry today. As we discussed in our initial comments, EPA correctly reported in the Report to Congress that most utility industry co-management occurs in surface impoundments and landfills, with an increasing trend toward dry landfill management of co-managed combustion wastes as well as a clear trend among these units to increased use of environmental controls such as liners, covers, leachate collection systems, and groundwater monitoring. These favorable developments vitiate the need for EPA to impose regulatory controls, regardless of the conclusions drawn from EPA's imperfect models. (USWAG00275)

## **XVIII. RISK CHARACTERIZATION**

### **G. Time to Risk**

One public interest group commenter expressed concern that EPA minimized its modeled characterization of risk because of the long migration times. The commenter argued that it would be inappropriate to ignore risks to future generations. The commenter also argued that the long term impacts of dredged sediment from closed impoundments are not adequately assessed.

Response: EPA reported the modeled times to risk as calculated, and agrees that long term risks are risks to future generations. Time to risk is indeed one factor in risk assessment, and near term risk is obviously of some greater concern than very long term risks in view of the many uncertainties in longer term risk assessment, including possibilities for risk management. EPA, however, did not dismiss or minimize the results based on consideration of time to risk exclusively. EPA also believes it has accurately portrayed risks from closed impoundments, within reasonable bounds and the capabilities of the current model.



**XVIII. RISK CHARACTERIZATION**  
**G. Time to Risk**  
**Verbatim Commenter Statements**

EPA also recommends regulation of oil-fired waste because of the relatively short time (50 years) that the metals are predicted to migrate to the receptor well. EPA dismisses the risks associated with the other wastes because the migration predicted by the model is ten times greater. There is no basis in EPA policies that allow potential contamination of drinking water supplies as long as it occurs to future generations. (ALA00036)

The remediation activities under the National Contingency Plan (Superfund) and policies under the Safe Drinking Water Act are predicated on protecting and sustaining drinking water supplies from contamination. EPA's conclusions that no action is necessary because contaminant migration is greater than 50 years is arbitrary and capricious. Decisions that run counter to each other are also inconsistent with EPA's overall goal to protect public health and sustain a natural environment. (ALA00036)

EPA dismisses the significant risks posed by groundwater contamination from FCC wastes because the waste constituents will not reach a hypothetical receptor well for 500 years. This conclusion contradicts the foundation of the safe drinking water program that is based on the protection and sustainability of clean drinking water supplies for future generations. (ALA00036)

In the Report's characterization of impoundments, it is noted that the impoundments are used for about 40 years, dredged and then covered. What is the fate of the dredged sediment from the impoundments? Are these wastes tested for the RCRA characteristics? It would seem that these wastes would contain high concentrations of metals that would be a consideration for final disposal. Are these impoundment wastes also covered under the blanket exemption proposed by EPA? If so, they should not be unless subject to a waste characterization analysis. (ALA00036)

EPA furthermore has suggested that there are no health impacts from the current disposal practices of FFC waste because the model used to estimate FFC waste migration estimates that it will take several hundred years for the contaminants to migrate to a hypothetical receptor well. We believe that EPA's decision not to regulate FFC waste because of the length of time it will take for contamination to migrate to a drinking water supply is shortsighted and inconsistent with EPA policy ... the Agency has a long and comprehensive policy record that supports programs to prevent drinking water contamination. These programs and activities are summarized below ... [the comment provides several pages summarizing EPA's drinking water protection programs]. (ALA000292)

**XVIII. RISK CHARACTERIZATION**  
**H. Multimedia Risks, Cumulative and Simultaneous Exposures**

Two public interest group commenters were concerned that EPA did not characterize the aggregate risks associated with the multimedia contamination of FFC wastes, even qualitatively. The commenters stated that cumulative exposures were not accounted for and that adequately protecting public health require that incremental risks be considered in addition to other plausible exposures to the same chemical, including those from nearby, non-FFC facilities. The commenters also expressed concern that the analysis failed to consider that inhalation exposure and groundwater exposure could occur at the same time and stated that EPA should have aggregated the results of the two analyses.

Response: EPA/OSW typically considers only incremental risks from the waste streams under consideration because consideration of exposures from other sources is not feasible for multi-site assessments such as this. However, as noted, EPA plans to take account of the potential for increased solid waste chemical concentrations if added air emission controls are implemented.

Simultaneous exposures from ground water and inhalation (as well as all other non-groundwater exposure routes) were not considered due to differences in time scale. Migration times for chemicals from the waste to ground-water wells range from hundreds to thousands of years depending on the chemical and the scenario.

Even if one were to cumulate very long term risks, on the presumption that inhalation risks might continue for thousands of years and coincide with then-occurring ground-water risks (a questionable presumption), the risks would still be at the orders of magnitude calculated and shown. No major cumulative effects can be plausibly argued from the combinations of receptors and times specified for this study.

**XVIII. RISK CHARACTERIZATION**  
**H. Multimedia Risks, Cumulative and Simultaneous Exposures**  
**Verbatim Commenter Statements**

According to the Commission on Risk Assessment and Risk Management one of the most serious flaws in risk assessment is evaluating risks chemical-by-chemical, medium-by-medium, and risk-by-risk. Although EPA conducted risk assessments of multiple pollutants and pathways, EPA did not characterize the aggregate risks associated with the multimedia contamination of FFC wastes, even qualitatively. For example, the child exposure scenario found that for coal-fired wastes deposited in an onsite landfill, arsenic, barium, and chromium pose risks from both groundwater and non-groundwater pathways. (ALA00036)

Cumulative exposures were not accounted for in either the groundwater or non- groundwater risk assessments. The peer review comments by James Butler recommended that the study “should attempt to evaluate additional major sources of potential exposure for at least the most significant contaminants of concern from FFCs, e.g. residual arsenic resulting from past pesticide applications. Another example would be to estimate existing body burdens and intakes of lead from other sources for children living in close proximity to coal- and oil-fired utility plants.” Adequately protecting public health requires that incremental risks be considered in addition to other plausible exposures to the same chemical. Sources of additional exposure include ingestion of metals in food, other industrial emissions, and air emissions from power plants burning fossil fuels from which the waste is generated. (ALA00036)

The inhalation exposure is assumed to occur while an impoundment is active. However, no leaching to the groundwater is assumed to occur until the impoundment is closed (and the wastes removed). Thus, the analysis fails to consider that inhalation exposure and groundwater exposure could occur at the same time. These concurrent exposures could be important, particularly for arsenic, which is a known human carcinogen by both the inhalation and ingestion pathways. (ALA00036)

Another step in the Agenda instructs the Agency to “develop new comprehensive policies to address cumulative and simultaneous exposures faced by children.” The Report fails this aspect of the Agenda. First, simultaneous exposures are not even considered given that the groundwater analysis and the above ground multipathway assessment are not coordinated with respect to timing of exposure (the exposures are essentially sequential rather than simultaneous). Second, the risk assessment does not consider cumulative or additive risks to children (or any other receptor). (ALA00036)

It appears that the inhalation exposure is assumed to occur while an impoundment is active, but no leaching to the groundwater is assumed to occur until the impoundment is closed. Concurrent,

cumulative exposures, however, could occur in the real world, and would be significant, particularly for arsenic. (49CAO00058)

The Report ... fails to address cross-media mercury releases. (49CAO00058)

We note one major omission/oversight in the Report: in analyzing human health impacts, the groundwater and non-groundwater pathway risks to the same human should be aggregated, such that a total health risk from all pathways is calculated and becomes part of the consideration whether and how the FFC wastes should be regulated. EPA has not included such aggregate human health risk figures in its Report to Congress. It seems that this was not done, in part, because the analyses were not conducted in such a way as to facilitate or allow for it. But that is a major oversight in the Report and in its findings. (ALA00292)

EPA did not evaluate the total risks associated with FFC waste contamination of groundwater and non-groundwater pathways. (ALA00292)

Aggregate risks to people from the same facility must be characterized in order to make the decision whether and how to regulate FFC wastes. (ALA00292)

## **XIX. DAMAGE CASES**

Many industry commenters emphasized EPA's finding of few damage cases as important support for the tentative conclusion to exempt the wastes from hazardous waste regulation. Some of these commenters further argued that the few damage cases (e.g., Schafer, A.B. Brown) found were not representative of current industry management practices. Public interest groups and citizen commenters, however, argued that the low apparent frequency of damages is an artifact of inadequate analysis and an over-reliance on industry data. A few of these commenters offered information on a number of additional candidate damage cases. These concerns are summarized in more detail below.

Response: EPA has carefully considered the additional candidate damage cases submitted by the public interest group commenters. Based on damage case information presented in the RTC and our review of comments, we conclude that there are 11 proven damage cases associated with wastes covered by today's regulatory determination. We identified seven of these damage cases in the RTC, so there are four new proven damage cases that were identified by commenters. We did find that for all 11 of the proven damage cases, either the state or EPA provided adequate follow-up to require or else undertake corrective action.

Additionally, we determined that another 25 of the commenter submitted cases are potential damage cases for the reasons described above. Thus, including the 11 potential damage cases that we identified in the background documents that support the RTC, we are aware of 36 potential damage cases. While we do not believe the latter 36 cases satisfy the statutory criteria of documented, proven damage cases because damage to human health or the environment has not been proven, we believe that these cases are indicative that these wastes pose a "potential" danger to human health and the environment. EPA's detailed analysis of the damage case information is available in the docket for this proceeding.

While the absolute number of documented, proven damage cases is not large, we believe that the evidence of proven and potential damage is significant when considered in light of the large numbers of facilities, particularly surface impoundments, that today lack basic environmental controls such as liners and groundwater monitoring. Given the huge volume of coal combustion wastes generated nationwide and the large number of facilities that currently lack groundwater monitoring, there is at least a substantial likelihood that other cases of actual and potential damage exist.

The review of potential damage cases was based only partly on industry-submitted data. However, we did not rely on the industry to identify or evaluate candidate damage cases. The specific concerns raised by the commenters with regard to the adequacy of its damage case analysis are addressed in the sub-topic later in this section.

### **Background**

Prior to issuing the RTC, we sought and reviewed potential damage cases related to these particular wastes. The activities included:

- a re-analysis of the potential damage cases identified during the Part 1 determination,
- a search of the CERCLA Information System for instances of these wastes being cited as causes or contributors to damages,
- contacts and visits to regulatory agencies in five states with high rates of coal consumption to review file materials and discuss with state officials the existence of damage cases,
- a review of information provided by the Utility Solid Waste Act Group and the Electric Power Research Institute on 14 co-management sites, and
- a review of information provided by the Council of Industrial Boiler Owners on eight fluidized bed combustion (FBC) facilities.

These activities yielded three damage case sites in addition to the four cases initially identified in the Part 1 determination<sup>2</sup>. Five of the damage cases involved surface impoundments and the two other cases involved landfills. The waste management units in these cases were all older, unlined units. The releases in these cases were confined to the vicinity of the facilities and did not affect human receptors. None of the damages impacted human health. We did not identify any damage cases that were associated with beneficial use practices.

Regarding ecological damage, while we did not identify any ecological damage cases in the RTC associated with management of coal combustion wastes, we reviewed the information on ecological damage submitted by commenters and agree that four of the seven submitted are documented damage cases that involve FFC wastes. All of these involve some form of discharge from waste management units to nearby lakes or creeks. These confirm our risk modeling conclusions as presented in the RTC that there could be adverse impacts on amphibians, birds, or mammals if they were subject to the elevated concentrations of selected chemicals that had been measured in some impoundments. However, no information was submitted in comments that would lead us to alter our conclusion that these threats are not substantial enough to cause large scale, system level ecological disruptions. These damage cases, attributable to runoff or overflow that is already subject to Clean Water Act discharge or stormwater regulations, are more appropriately addressed under the existing Clean Water Act requirements.

Our FFC analysis drew a distinction between primary and secondary MCL exceedences because we believe this factor is appropriate in weighing the seriousness of FFC damage in terms of indicating risk to human health and the environment. For FFC, in the RTC, we reported only the “proven” damage (i.e., exceedence of a health-based standard such as a primary MCL and

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<sup>2</sup> The Part 1 determination identified six cases of documented damages. Upon further review, we determined that two of these cases involve utility coal ash monofills which are covered by the Part 1 determination. However, the other four cases involved remaining wastes that are covered by today’s determination.

measurement in ground water or surface water). We also identified a number of potential FFC damage cases (eleven) which were included in the background documents that support the RTC.

Unlike the primary MCLs, secondary MCLs are not based on human health considerations. (Examples are dissolved solids, sulfate, iron, and chloride for which ground water standards have been established because of their effect on taste, odor, and color.) While some commenters believe that elevated levels of some secondary MCL parameters such as soluble salts are likely precursors or indicators of future hazardous constituent exceedences that could occur at coal combustion facilities, we are not yet able and will not be able to test their hypothesis until we complete our analysis of all comments received on our groundwater model and risk analysis, which will not be concluded until next year.

Of the 59 damage cases reported by commenters, 11 cases appear to involve exceedences of primary MCLs or other health-based standards as measured either in off-site ground water or in nearby surface waters, the criteria we used in the RTC to identify proven damage cases. Of these eleven cases, two are coal ash monofills which were included in the set of damage cases described by EPA in its record supporting the Part 1 regulatory determination. The remaining nine cases involve the co-management of large volume coal combustion wastes with other low volume and uniquely associated coal combustion wastes. We had already identified five of these nine cases in the RTC. Thus, only four of these eleven damage cases are newly identified to us. Briefly, the four new cases involve:

- Exceedence of a state standard for lead in downgradient ground water at a coal fly ash landfill in New York. There were also secondary MCL exceedences for sulfate, dissolved solids, and iron.
- Primary MCL exceedences for arsenic and selenium in downgradient monitoring wells for a coal ash impoundment at a power plant in North Dakota. There were also secondary MCL exceedences for sulfate and chloride.
- Primary MCL exceedences for fluoride and exceedence of a state standard for boron in downgradient monitoring wells at a utility coal combustion waste impoundment in Wisconsin. There was also a secondary MCL exceedence for sulfate.
- Exceedence of a state standard for boron and the secondary MCL for sulfate and manganese in downgradient monitoring wells at a utility coal combustion landfill in Wisconsin.

We found that in each of the 11 proven damage cases the state (or EPA in two cases under the Superfund program) took appropriate action to require or conduct remedial activities to reduce or eliminate the cause of contamination.

Nineteen of the candidate damage cases submitted by commenters involve either on-site or off-site exceedences of secondary MCLs, but not primary MCLs or other health-based standards.

Consistent with our CKD analysis, we consider these cases to be indicative of a potential for damage to occur at these sites because they demonstrate that there has been a release to ground water from the waste management unit.

Regarding the remaining 29 cases submitted by commenters:

- Six involve primary MCL exceedences, but measurements were in ground water either directly beneath the waste or very close to the waste boundary, i.e., no off-site ground water or receptor measurements indicated that ground water standards had been exceeded. Consistent with our analysis of damage cases for cement kiln dust, we consider these six cases to be indicative of a potential for damage to occur at these sites because they demonstrate that there has been a release to ground water from the waste management unit..
- Eighteen case summary submissions contained insufficient documentation and data for us to verify and draw a conclusion about whether we should consider these to be potential or proven damage cases. Of these 18 cases, commenters claimed that 11 cases involve primary MCL exceedences, and another two involve secondary MCLs, but not primary MCLs. The other five cases lacked sufficient information and documentation to determine whether primary or secondary MCLs are involved. Examples of information critical to assessing and verifying candidate damage cases that was not available for these particular cases include: identification of the pollutants causing the contamination; identification of where or how the damage case information was obtained (e.g., facility monitoring data, state monitoring or investigation, third party study or analysis); monitoring data used to identify levels of contaminants; and/or sufficient information to determine whether the damages were actually attributable to fossil fuel combustion wastes; and/or location of the identified contamination (i.e., directly beneath the unit or very close to the waste boundary or at a point some distant (e.g., 150 meters) from the unit boundary).
- Three case submissions are cases we identified in the Part 1 determination and involve monofilled utility coal ash wastes. However, as explained in the Report to Congress for the Part 1 determination, EPA determined that there was insufficient evidence to consider them to be documented damage cases.
- One case did not involve fossil fuel combustion wastes.
- One case involved coal combustion wastes and other unrelated wastes in an illegal, unpermitted dump site. This site was handled by the state as a hazardous waste cleanup site.



In summary, based on damage case information presented in the RTC and our review of comments, we conclude that there are 11 proven damage cases associated with wastes covered by today's regulatory determination. We identified seven of these damage cases in the RTC, so there are four new proven damage cases that were identified by commenters. We did find that for all 11 of the proven damage cases, either the state or EPA provided adequate follow-up to require or else undertake corrective action. We were not able to identify any proven damage cases involving minefilling practices and beneficial uses of coal combustion wastes.

EPA's detailed analysis of the damage cases submitted by commenters is available in the public docket for this regulatory determination (*Rationale and Conclusions Regarding Commenter-Identified Fossil Fuel Combustion Waste Damage Cases and Additional Information Regarding Fossil Fuel Combustion Waste Damage Cases*; SAIC to Dennis Ruddy, EPA; April 20, 2000)

**XIX. DAMAGE CASES**  
**Verbatim Commenter Statements**  
**General Comments**

As set forth in greater detail below, key deficiencies include the following ... Grossly incomplete data gathering, and improperly restrictive tests of proof, regarding FFCW damage cases. (EDF00021)

The damage case analysis performed for both Reports to Congress is wholly inadequate. (EDF00021)

Many of the rationales offered to exclude the damage cases are legally deficient and otherwise inappropriate. (EDF00021)

The damage case data gathering was unduly limited, and the tests of proof applied were arbitrarily restrictive. (EDF00021)

The Report is devoid of discussion of the dozens of cases of contamination and damage to the environment throughout the country from disposal of coal combustion and other fossil fuel wastes, many of which pose danger to human health. Every one of these is documented by state and/or federal agencies. The failure to present this evidence amounts to an egregious failure to address the third study factor. This appears to have been a deliberate deficiency designed to support the conclusions of minimal risks in the risk assessments underlying the Report. (HEC00056)

The vast majority of scientific investigations and reports that we have seen which document contamination of ground or surface waters from coal combustion wastes have not been part of any litigation or state enforcement action. Yet involvement in such formal actions is a criteria for the “test of proof” utilized in this Report to determine whether damage has occurred. By avoiding discussion of the documented evidence of damage unless this criteria is met, the Report presents a deficient and false picture in which the great preponderance of damage from fossil fuel wastes is presumed not to exist. (HEC00056)

We are aware of at least 41 cases of disposal of coal combustion waste in “which danger to human health or the environment has been proved.” None of these were mentioned in this Report. (HEC00056)

EPA has stated they can only find six damage cases caused by CCW. What constitutes a damage case? With limited resources, HEC has located over fifty cases from around the country where CCW has resulted in contamination of ground and surface water many times the drinking water and health standards for a variety of chemicals. We have sent detailed reports on several of these cases

to EPA, but none of them were discussed in the report. This is further evidence that EPA must take the time to examine all of the data available. (HEC00056)

All six of these cases have rendered groundwater unusable for drinking and/or irrigation, but EPA has not considered a single one as a damage case. The “burden of proof” EPA used for its determination excludes all but a few cases of where CCW has caused significant damage to groundwater sources. Groundwater is a valuable resource throughout the country. Yet, EPA does not consider the dozens of cases where CCW has rendered groundwater useless to be damage cases. For EPA to write a determination that takes adequate steps to protect the rights and property of citizens living next to ash disposal sites who use groundwater; they must take the time to examine each case of contamination from CCW, or give us more time to submit full reports on the cases we have found. (HEC00056)

EPA’s lax approach toward minefills in its Draft Determination and Report to Congress stems from the Agency’s failure to carry out a crucially important assessment of actual damages from CCW and other fossil fuel wastes throughout the country. HEC has gathered information and data about 34 new cases of damage to groundwaters as part of these comments. This brings the total number of cases submitted by HEC to EPA before the release of the Draft Determination and during public comment on the Determination to 56 cases of damage to the environment, ecosystems and ground water supplies from CCW. (HEC00332)

HEC has uncovered 34 additional damage cases that EPA has apparently overlooked. EPA must assess and acknowledge the extent of damage caused by lax regulation of CCW and other fossil fuel combustion wastes. (HEC00332)

Damage Cases: This is probably the heart of the problem with this Report to Congress as well as the USEPA’s previous determination for high volume, non-co-managed wastes ... The only way that full deregulation can be justified is by using so narrow a definition of damage that almost nothing qualifies as damage. This is what the USEPA did in the Report to Congress and this is what USWAG is arguing to retain. (GHIL0012)

There are two aspects of the criteria used by USEPA in the Report to Congress that will unduly and severely limit sites that qualify as damage cases. The first is the requirement that the site or incident have the imprimatur of a court action or finding, and the second is that only RCRA elements be considered as damaging contaminants. Each leads to its own set of under-reporting of damages. (GHIL0012)

The Report to Congress and the public should include a realistic assessment of the damage that CCW has caused to water and the environment under the present disposal scenarios. That assessment should not be limited to any particular list of contaminants. If a resource is lost or impaired, the inventory should reflect that. If the environment has been damaged, the inventory

should reflect that. If human health or safety has been or is endangered, the inventory should reflect that. Only once that inventory is known can intelligent policy decisions be made. (GHIL0012)

EPA's policy decision to accept as "damage" cases for inclusion in the Report to Congress pursuant to 42 U.S.C. § 6982(n)(4), only cases in which an enforcement action or other litigation has been brought, rather than documented cases of actual physical damage to the environment for which an enforcement proceeding has not been initiated, is contrary to legal authority and precedent. "Actual" damage cases for FFC waste exist and will be included in this docket. (ALA00292)

The damage case analysis included in this Report to Congress is wholly inadequate. (ALA00292)

Unfortunately, EPA has relied heavily upon the very industry it is regulating as the major source of information in the report. EPA has also rejected the grand majority of evidence of contamination from CCW due to a "test of proof" that is far more strict than what is required by law and what EPA has used in other reports. As a result, the report whitewashed the real threat posed by CCW. (SIERRA00278)

The Administrator is obligated to conduct independent inquiry into the nature and scope of damage associated with co-disposal of coal combustion wastes at mining operations and to collect such data as is necessary to support the conclusions with respect to regulation or non-regulation. (NCCLP00282)

EPA has chosen to rely almost entirely on data submitted by third parties to support an assessment of whether the risks associated with improper disposal warrant such effort, yet has inexplicably failed to acknowledge the full range of evidence of groundwater contamination associated with current CCW disposal practices. (NCCLP00282)

The rejection of such information as has been developed demonstrating contamination because of questions concerning quality control or background, is an easy but inappropriate response. (NCCLP00282)

U.S. EPA should base its recommendations and decisions not on risk assessment or a harsh interpretation of "test of proof", but on the precautionary principle, assuring that there will be no adverse effects to public health and the environment associated with disposal of CCW. (CITZ00358)

In oral and written comments by the HEC, three Indiana sites were characterized as "damage cases." Mr. Stant of the HEC at the public hearing stated that these sites do not meet the EPA criteria to be damage cases. Therefore, they were not identified as "damage cases" in the Report to Congress. The HEC has claimed that the Schafer Station Landfill and A.B. Brown Station Landfill

are sites having significant environmental concerns and that EPA should pay special attention to these sites in reaching its final regulatory determination. HEC's suggestion that these particular sites are somehow representative of CCP disposal sites is incorrect. The two landfill sites are not representative of CCP sites in general. In those isolated instances referenced above in which peculiar circumstances have resulted in minor environmental impacts, the materials disposed of and the placement practices followed are not representative of current industry management practices and materials. (IEU0018)

In any event, the Schafer and AB Brown sites are landfills that are atypical CCP sites. They are simply poor candidates as case studies for making generalizations about CCP. (IEU00018)

In general, we agree with EPA's determination that ... There are few documented damage cases associated with the management of the wastes studied. (PG&E0023)

The only documented cases of proved environmental damages attributable to co-managed combustion wastes were the four sites identified in the 1993 Bevill regulatory determination and a newly identified site in North Dakota. EPA correctly pointed out that each of these sites involved older, unlined units, and that the releases were confined to the immediate vicinity of the facility and resulted in no human health effects. The significance of this finding is that the few documented damage cases show that co-managed combustion wastes have virtually no effect on human health receptors and that the trend toward lining and other environmental controls at newer facilities shows that any problem that might exist is limited to a small declining universe of older facilities. (USWAG00037)

We believe that EPA generally established an appropriate basis for identifying documented cases of environmental damage. (USWAG00037)

EPA's standard for identifying damage cases is a Permissible interpretation of the Bevill amendment ... EPA's "Tests of Proof" constitutes a generally appropriate and reasonable methodology for identifying proven damage cases. (USWAG00275)

Treatment of exceedances of secondary drinking water standards as damage cases would be inappropriate. (USWAG00275)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00256)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (VWI00258)

The EPA must gather its own information on CCW contamination rather than relying only on industry's biased reports, report all cases where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage. (CITZ00260)

The EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards, or has caused ecological damage. (CITZ00261)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00263)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00264)

In making its regulatory determination, EPA should consider all instances in which CCW contamination has exceeded state and federal health and drinking water standards. Additionally, EPA should rely on scientific articles and reports, which document exceedences, which have led to ecological damage from the disposal of CCW. (CITZ00265)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (SAVV00266)

Any documented cases of CCW contamination should be carefully examined by the EPA to determine their impact upon drinking water and fisheries. (CITZ00267)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage. (SOCM00279)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health advisories and drinking water standards or has caused ecological damage. (CITZ00284)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (KYC00285)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00286)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00287)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00289)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (SIERRA00278)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00290)

I believe that EPA should ... Consider all cases of contamination where CCW has exceeded state and federal health advisories and drinking water standards or has caused ecological damage. (CITZ00291)

Due to the potential long term impacts of CCW burial on groundwater quality and the high cost in terms of funds, man-power, and environmental concerns should CCW's be proven to negatively affect aquifers in which they're buried, I encourage EPA to research or obtain needed unbiased data from independent sources. (PURD00294)

The EPA must develop its own technical background information and not rely only on information supplied by industry. The potential for toxins in the waste will have long-term detrimental effects not only on our environment, but to our own health and the health of our future generations. The EPA must consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards. It is the responsibility of the EPA to make an unbiased evaluation of all of the technical information available. (TRI00295)

I would urge you to collect your own data to confirm this. It would certainly be unwise to rely on the regulated industry for information. (CITZ00303)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00311)

EPA needs to consider all cases in which contamination from CCW as exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00312)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00313)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00314)

I also urge the EPA to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage. (CITZ00315)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00316)

I have been informed that a significant amount of the early studies were based on data supplied by the studies of the industries who would benefit the most from improper disposal of CCBs. Your decision should be, obviously, based on your own data. The information from industry and environmental groups should be taken with a grain of salt - each will present data that support their respective views. (CITZ00317)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00318)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00319)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00320)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00321)



EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00322)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00323)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00324)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00325)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00326)

EPA needs to consider all cases in which drinking water standards (state & federal) have been exceeded (violated). EPA should also consider documented scientific articles that cause damage as examples of damage in its regulatory determination. (CITZ00327)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00331)

It is also imperative that the EPA not depend upon industry data regarding CCW contamination. There is a likelihood that these numbers are biased in the favor of the interests of polluters. (BUCK00333)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (NCSEA00334)

There are many cases where CCW had caused contamination of drinking water & ecological damage. Please conduct a diligent literature search so past mistakes can be avoided. It is important for the EPA not rely solely on the information provided by industry, as it is difficult for anyone to provide information detrimental to their own

benefit. The EPA should make a strong effort to review information from other sources when making decisions that have the potential to impact seriously current & future generations. (CITZ00335)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00336)

I also urge the EPA to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage. (CITZ00337)

Likewise, EPA needs to do an independent assessment of federal and state health and drinking water standards to learn if they have been exceeded due to CCW contamination. Also, it should seriously consider scientific literature where CCW contamination has been documented as causing damage to the ecology of the areas under study. (CITZ00338)

I strongly believe that, in making its regulatory determination, the EPA needs to do an independent assessment of the following: 1. Those cases in which federal and state health and drinking water standards have been exceeded due to CCW contamination, and, 2. Instances in the scientific literature where CCW contamination has been documented as causing damage to the ecology of the areas under study. (CITZ00339)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00340)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00343)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00344)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00345)

EPA needs to consider all cases of contamination where coal combustion waste has exceeded state and federal health advisories and drinking water standards or has caused ecological damage. (CITZ00346)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00348)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00349)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00350)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00351)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00352)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00353)

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EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00356)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00357)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground

water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00360)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00361)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00362)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00363)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00364)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00365)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground

water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00366)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00367)

EPA should ensure the objectivity, accuracy, and completeness of this report by ... gathering its own information rather than relying on highly biased information supplied by the industry and state agencies which behave more as advocates than observers ... considering all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (POW00369)

I hope the EPA will strive to gather its own information on CCW contamination, rather than relying on coal company information. I hope the EPA will consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage. (CITZL0013)

## **XIX. DAMAGE CASES**

### **A. Information Provided**

One public interest group commenter provided information on a number of candidate damage cases based on the commenter's collection and review of state file information and monitoring data. A number of other public interest group and citizen commenters made reference to the candidate cases submitted and urged EPA to consider them closely. Other public interest group and academic commenters submitted reports on scientific studies that present cases describing ecological damage caused by coal combustion wastes.

Response: EPA appreciates the efforts expended by commenters to provide documentation of damage cases. EPA has carefully considered all of the candidate damage cases submitted by the public interest group commenters through the close of the public comment period. Based on damage case information presented in the RTC and our review of comments, we conclude that there are 11 proven damage cases associated with coal combustion wastes covered by today's regulatory determination. We identified seven of these damage cases in the RTC, so there are four new proven damage cases that were identified by commenters.

Additionally, we determined that another 25 of the commenter-submitted cases concerning coal combustion wastes are potential damage cases for the reasons described earlier in this section. Thus, including the 11 potential damage cases that we identified in the background documents that support the RTC, we are aware of 36 potential damage cases. While we do not believe the latter 36 cases satisfy the statutory criteria of documented, proven damage cases because damage to human health or the environment has not been proven, we believe that these cases are indicative that these wastes pose a "potential" danger to human health and the environment.

A discussion of EPA's analysis of commenter-submitted damage cases appears at the beginning of this section. EPA's detailed analysis of the commenter-submitted damage case information, which includes evaluation of the case-specific points and arguments made by commenters, is available in the docket for this proceeding (*Rationale and Conclusions Regarding Commenter-Identified Fossil Fuel Combustion Waste Damage Cases*, and *Additional Information Regarding Fossil Fuel Combustion Waste Damage Cases*; SAIC to Dennis Ruddy; April 20, 2000.)

**XIX. DAMAGE CASES**  
**A. Information Provided**  
**Verbatim Commenter Statements**

The Hoosier Environmental Council wishes to submit the following attached information for the record of public comment on the United States Environmental Protection Agency's Report to Congress, Wastes from the Combustion of Fossil Fuels. Volume I - Executive Summay, and Volume 2 - Methods, Findings, and Recommendations. Two copies each of the following ten cases of damages to the environment. particularly ground waters at disposal sites for coal combustion wastes in Illinois and Wisconsin ... [comment provides several pages summarizing alleged cases with additional information provided in attachments]. (HEC00055)

EPA has stated they can only find six damage cases caused by CCW. What constitutes a damage case? With limited resources, HEC has located over fifty cases from around the country where CCW has resulted in contamination of ground and surface water many times the drinking water and health standards for a variety of chemicals. We have sent detailed reports on several of these cases to EPA, but none of them were discussed in the report. This is further evidence that EPA must take the time to examine all of the data available. The following are just a few examples of cases of contamination that have not been considered by EPA to be damage cases ... [comment provides several pages summarizing alleged damage cases]. (HEC00056)

Thus EPA overlooked or rejected numerous cases where contamination from CCW has rendered ground and surface water unusable or caused other serious environmental damage ... [comment provides several pages summarizing alleged damage cases with additional information provided in attachments]. (HEC00332)

Nonetheless, EPA's search of the CERCLA Information System does not appear to be very thorough. HEC located two Superfund sites where CCW has been documented to be causing contamination that are located on the CERCLA list: the Dixie Caverns County Landfill in Virginia and the Vitale Fly Ash Pit in Massachusetts. While several different types of waste were disposed at these sites in both cases, EPA reports contamination occurring that is clearly linked to fly ash. Yet, these sites were not considered in the report as damage cases. A more complete discussion of each site is given below ... [comment provides several pages summarizing alleged damage cases with additional information provided in attachments]. (HEC00332)

The following sites are considered relevant damage cases because, in each case, the site has been identified by the responsible state agency as a site with contamination by one or more regulated constituents at levels beyond that State's standards, as documented by state-required monitoring systems, using state-mandated sampling protocols. The following data summaries the data presently available to HEC as a result of its search efforts ... [comment provides several pages

summarizing alleged damage cases with additional information provided in attachments]. (HEC00332)

We are sending more detailed information on some of the sites discussed in our comments on the draft Regulatory Determination on fossil fuel combustion wastes. The enclosed sites are located in North Dakota and Alabama. These were all sites that staff within the respective state agencies have identified as cases of contamination from coal combustion waste (CCW). We have also received further information on the sites in Virginia, and will be sending reports on these sites as soon as possible ...[comment provides several pages summarizing alleged damage cases with additional information provided in attachments]. (HECL0009)

We have been gathering further information on phenol contamination at the C.R. Huntley and Danskammer sites. At the Huntley site, groundwater monitoring data clearly shows the phenol contamination coming from a closed ash disposal cell within the landfill. A state inspector, Richard Sthor, has also stated to us that the phenol contamination is occurring from the ash. Phenol contamination is also occurring at the Danskammer site, but the data is not as conclusive. Considering the lack of testing or monitoring for phenols at other ash sites around the country, further consideration and study of the presence of phenols in CCW is needed. We will be submitting a report on the Huntley and Danskammer sites as soon as possible, and urge you to consider the implications of the findings at these sites in the final Determination. (HECL0014)

We have enclosed a chart of 61 cases of contamination from CCW. This chart demonstrates that CCW contamination is not isolated to a few special cases, and that this contamination is damaging public water supplies and the environment. (HECL0014)

I have enclosed a review of the adverse environmental impacts that can occur from CCW constituents. The landfill sites from which the data were obtained came from efforts by the HEC. (VATL0010)

The enclosed packet includes some of our recent peer-reviewed publications on environmental impacts of coal combustion wastes in South Carolina. While downstream water quality parameters at our study site are within the NPDES criteria, the 40 acre disposal area is heavily contaminated and used by many aquatic, terrestrial, and avian species. In several species, exposure to coal ash and accumulation of trace elements is associated with deformities which affect feeding and swimming, behavioral modifications that increase susceptibility to predation, disruption of endocrine systems, severe modifications to energy budgets, inability to complete metamorphosis, and impaired reproduction. (SRELXXXX)

Some of the most relevant of the published research reported by RTI is the work on the ecological risks to receiving waters, undertaken at the Savannah River Ecology Laboratory by Rowe, Congdon and Hopkins. We understand that these researchers will be submitting all their published papers as comments to this docket ... [comment summarizes this research] ... A related study in



Ohio (Hatcher et. al 1992) samples lake sediments, macrozoobenthos and fish near a coal ash disposal basin on the western shore of Lake Erie ... [comment summarizes this research] ... We believe that the data collected by these researchers meets the test of proof to be treated as a damage case. Certainly this will be true if EPA follows precedent set in other Bevill waste reports and permits scientifically proven damage cases. (ALA00292)

The IEU review of the administrative record compiled to date indicates that several Indiana sites have been suggested as so-called "damage cases." The IEU comments will also address this issue and demonstrate how these characterizations are misleading. Of the three Indiana sites about which concerns have been raised to the EPA by the Hoosier Environmental Council (HEC), the Universal Mine site will be addressed in the USWAG comments titled the "Synthesis of Available Information on the Management of Coal Combustion Products in Mines." The other two sites are landfills and do not meet the criteria for co-managed sites. We have submitted comments regarding these two sites today even though they were covered under the first phase of the Bevill Determination. (IEU00018)

Both Schafer and A.B. Brown are on-site landfills that disposed of flue gas desulfurization (FGD) materials from dual alkali scrubber systems. Again, these materials are neither co-managed, nor are they from co-burning of alternative fuels. Therefore these materials are not CCP subject to this regulatory determination. These CCP sites were addressed by the Phase I Bevill regulatory determination. The type of FGD material placed in these landfills is unique to these two sites in Indiana and perhaps the country. Both facilities have or are in the process of correcting the minor environmental impacts and are actively seeking ways to beneficially reuse the FGD products they currently are producing. The Schafer Station converted its dual alkali scrubber system in late 1997 and no longer produces this type of FGD material. This site now makes wallboard-grade calcium sulfate (gypsum) and will be utilizing 100% of the materials in wallboard production as soon as the on-site wallboard plant construction is completed. (IEU00018)

The HEC often mischaracterize groundwater data collected at Indiana Utility sites. The concerns raised by the HEC regarding the Schafer site has been from localized monitoring wells (two of which are placed at the waste boundary) which show contamination from soluble salts. Other down gradient monitoring wells placed farther away but within the company property boundary show no contamination. Most importantly, one-half of the closed portion of the landfill was capped with a membrane barrier in 1998 and the other half is being capped this year with an impermeable membrane. The Schafer site was not a typical site and is not representative of CCP sites in general. (IEU00018)

SIGECO A. B. Brown plant uses a dual alkali scrubbing system and is the only power plant in Indiana that currently utilizes this scrubbing process. To address problems with material that was placed in the landfill during the scrubbers first few years in operation, the SIGECO voluntarily installed a slurry wall which was completed in February 1987 to capture any contaminants. There

has been no significant increase or decrease in the monitored levels in the two wells to which the Hoosier Environmental Council referred to in their testimony (MW-3 and MW-4.3B) in the last 5-10 years. Because the numbers appear to be relatively constant, it is believed that a small pocket of contaminants is trapped outside the slurry wall in the vicinity of MW-3 and MW-4.3B and this is what is being sampled at these well locations. It is reasoned that the above mentioned wells have not seen reduced levels of contamination even after the installation of the slurry wall because the same groundwater is being sampled over and over again. SIGECO has recently installed continuous pumps in these wells in an attempt to eliminate any "pooled" materials, and they are hopeful the concerns about these two wells will finally be put to rest. Other wells located outside the slurry wall do not show an impact. SIGECO has recently replaced three wells that were located within the landfill footprint with two additional wells located downstream of MW-3 and MW-4.3B to insure the groundwater off-site is not being impacted. As a final note, SIGECO has stated numerous times that the dual alkali scrubber materials from the A. B. Brown plant will not be back-hauled. In any event, the Schafer and AB Brown sites are landfills that are atypical CCP sites. They are simply poor candidates as case studies for making generalizations about CCP. (IEU00018)

CCW has contaminated ground and surface water at dozens of sites around the country many times over the federal drinking water standards for contaminants such as arsenic, boron, cadmium, chromium, vanadium, lead, selenium, sulfates, and chlorides. Contamination from CCW has also been documented in a number of scientific studies to cause deformities, reproductive problems, and even death in a wide variety of organisms ranging from plankton to amphibians and mammals. (SIERRA00278)

Because of the inadequacy of EPA's damage case investigation to date, the Hoosier Environmental Council (HEC) and others have collected damage information and forwarded it to EPA for inclusion in the Report and/or consideration in the upcoming regulatory determination. For a variety of reasons, EPA has thus far refused to acknowledge these damage cases. (EDF00021)

Using the very restrictive criteria of the Report to Congress, the USEPA listed only six damage cases nationwide. However, these six are not a complete accounting of damage cases, even by these criteria. Using its own limited resources and volunteer contributions, the Hoosier Environmental Council (HEC) more than tripled the number of cases that qualified as damage under the restrictive criteria in a period of less than a year. This effort is ongoing and has by no means identified all damage cases. (GHIL0012)

HEC's ongoing search for sites with serious CCW contamination has produced more than 60 sites to date that involve state regulatory action due to violations of state water quality standards, data from state regulatory files, or published studies using data collected with protocols equivalent to state agency protocols. (GHIL0012)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories which show damage occurring from CCW that were ignored in the report. (CITZ00256)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories which show damage occurring from CCW that were ignored in the report. (VWI00256)

As I'm sure you are aware, environmental groups have already identified 60 contamination cases, numerous scientific reports, and five advisories against eating fish as a result of CCW. Why were these Instances ignored in EPAs Report to Congress? (CITZ00261)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories which show damage occurring from CCW that were ignored in the report. (CITZ00263)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories which show damage occurring from CCW that were ignored in the report. (CITZ00264)

I am aware that CCW has contaminated both surface and ground water at several sites around the country. (CITZ00265)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories which show damage occurring from CCW that were ignored in the report. (SAVV00266)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories which show damage occurring from CCW that were ignored in the report. (SIERRA00278)

Coal combustion wastes have polluted ground and surface water at dozens of sites around the country many times over the federal drinking water standards for contaminants such as arsenic, boron, cadmium, chromium, vanadium, lead, selenium, sulfates, and chlorides. A number of scientific studies have shown that contamination from CCW has caused deformities, reproductive problems, and even death in a wide variety of organisms ranging from plankton to amphibians and mammals. (CITZ00284)

Environmental groups have already identified 60 ground water contamination cases, 40-50 scientific reports, and 5 advisories against eating fish as a result of contamination from CCW. All these show damage occurring from CCW and were ignored in the report. (CITZ00284)

To date, environmental groups have identified at least 60 cases of groundwater contamination, 40-50 scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (KYC00285)

To date, environmental groups have identified at least 60 cases of groundwater contamination, 40-50 scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00286)

To date, environmental groups have identified at least 60 cases of groundwater contamination, 40-50 scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00287)

To date, environmental groups have identified at least 60 cases of groundwater contamination, 40-50 scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00289)

To date, environmental groups have identified at least 60 cases of groundwater contamination, 40-50 scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00290)

Environmental groups have already identified 60 ground water contamination cases, 40-50 scientific reports, and 5 advisories against eating fish as a result of contamination from CCW. All these show damage occurring from CCW and were ignored in the report. (CITZ00291)

Given the overwhelming evidence of contamination from CCW it seems only logical to treat CCW as any other hazardous waste and regulate it under RCRA Subtitle C. (CITZ00303)

We want to emphasize in the strongest possible terms, our support of the Hoosier Environmental Council's efforts in this regard --we have seen the file after file, the manifold documents and studies which show that coal wastes dumped over watersheds leaches dangerous materials. We feel that it is not only dangerous to the many on well and spring water, but to those coming onto municipal water systems as well--most of those systems rely also on well and spring water--or draw from the rivers fed by such aquifers. (PEACE00306)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00311)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00312)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00313)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00314)

Environmental groups have already identified 60 contamination cases, several dozen scientific reports, and 5 advisories against eating fish. All these show damage occurring from CCW and were ignored in the report. (CITZ00315)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00316)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00318)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00319)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00320)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00321)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00322)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00323)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00324)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00325)

Environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories which show damage occurring from CCW. (CITZ00326)

To date, Environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories all due to damage from CCW. These cases were ignored in the Report to Congress (although it took 17 years to complete). (CITZ00327)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00331)

To date, environmental groups have identified at least 60 cases of groundwater contamination, 40-50 scientific reports, and 5 fish consumption advisories which show damage from CCW that were ignored in the report. (NCSEA00334)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00336)

Environmental groups have already identified 60 contamination cases, several dozen scientific reports, and 5 advisories against eating fish. All these show damage occurring from CCW and were ignored in the report. (CITZ00337)

Presently, there are at least 13 permitted disposal sites all within 120 miles of Evansville, and another 22-year-old monofill at the A. B. Brown electric power plant in nearby Posey County which has already demonstrated contamination to area water resources. SIGCORP, the company which operates the plant, should be commended for installing monitoring wells which identified the NPDES exceedences which were found as the result of a lined facility. Nevertheless, had these monitoring wells not been in place, nobody would have ever learned of the contamination which was found. (CITZ00338)

This has already occurred in numerous instances and a map of these contamination sites is available on the web page of the Hoosier Environmental Council. To date, at least 60

contamination cases, several dozen scientific reports and at least five fish consumption advisories in which damages resulted from CCW dumping have been cited. All of these studies have apparently been ignored by the agency. (CITZ00338)

I have been informed that to date, groups concerned about the environment have identified at least 60 contamination cases, several dozen scientific reports and at least five fish consumption advisories in which damage from CCW dumping was cited. All of these studies were ignored in the report. (CITZ00339)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00340)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00343)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00344)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00345)

Here in Webster County, West Virginia we experienced in 1990, a serious case of stream pollution because of the mishandling of coal combustion waste (CCW) (flyash) by a local coal company. (CITZ00346)

Environmental groups have already identified sixty ground water contamination cases, over forty scientific reports and five advisories against eating fish as a result of contamination from coal combustion waste. (CITZ00346)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00348)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and 5 fish consumption advisories which show damage occurring from CCW that were ignored in the report. (CITZ00349)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00350)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00351)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00352)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00353)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00354)

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To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00356)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that were ignored in the report. (CITZ00357)

HEC and other environmental groups have documented the hazardous nature of CCW and cited to U.S. EPA 60 some cases of CCW contamination which have exceeded state and federal health and drinking water standards, and many scientific articles on ecological damage from CCW, and 5 fish consumption advisories, which were ignored by U.S. EPA in its Draft Report. Since then, many more cases of serious ground water contamination, scientific reports on deformities, reproductive problems, etc. have been added to this substantial body of evidence, which should serve as a basis for U.S. EPA's decisions and regulatory requirements. (CITZ00358)



To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that was ignored in the report. (CITZ00360)

The evidence of ground water contamination is alarming and everyone is still standing around while these reports are poring in to your office. (CITZ00361)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that was ignored in the report. (CITZ00361)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that was ignored in the report. (CITZ00362)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that was ignored in the report. (CITZ00363)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that was ignored in the report. (CITZ00364)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that was ignored in the report. (CITZ00365)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that was ignored in the report. (CITZ00366)

To date, environmental groups have identified at least 60 contamination cases, several dozen scientific reports, and at least 5 fish consumption advisories which show damage from CCW that was ignored in the report. (CITZ00367)

CCW has already contaminated ground and surface water at dozens of sites around the country many times over the federal drinking water standards for contaminants. (POW00369)

Two dumps near Michigan City, have been tested and one was found to have 100 times the safe level of arsenic. The other has 21 times the safe level of lead. (CITZL0011)

CCW contaminates ground and surface water at dozens of sites around the country many. The toxic substance associated with CCW – contaminants such as arsenic, boron, cadmium, chromium, vanadium, lead, selenium, sulfates, and chlorides – are associated with human and wildlife health problems – sometimes even death for some life forms. (CITZL0013)

## **XIX. DAMAGE CASES**

### **B. Appropriateness of Tests of Proof**

Several public interest group and citizen commenters argued that EPA's scientific investigation test of proof was overly restrictive. By requiring litigation or state enforcement, cases are eliminated where environmental damage has occurred, but the state has not taken action or the unit is unregulated. One industry trade group stated that EPA's scientific investigation test of proof was reasonable and consistent with past Agency studies, but commented that EPA should not use out-of-court settlements to satisfy the test of proof for damage cases.

Response: The Agency, in its tests of proof for damage case identification, does not make litigation or state enforcement cases a necessary condition or pre-condition for identifying damage cases. The overview description of damage case analysis for FFC in the RTC clearly does not require that litigation or state enforcement be involved with every damage case (see March 1999 RTC at pp. 1-8 and 1-9). Moreover, the Agency was not arbitrary in defining the tests of proof. As explained in the FFC RTC (p. 1-8), the Agency subjected the tests to public comment and has used the same tests of proof in prior reports to Congress for Mineral Processing (1990) and Cement Kiln Dust (1993).

The Agency has and would still consider using documentation of out-of-court settlements as a basis for proven damages in cases where there is evidence or otherwise an admission of damages.

**XIX. DAMAGE CASES**  
**B. Appropriateness of Tests of Proof**  
**Verbatim Commenter Statements**

EPA's scientific investigation test of proof is overly restrictive. First, EPA's 'tests of proof' for damage cases are arbitrary, capricious, and unsupported by law ... Specifically, all of the tests of proof require either the initiation of state enforcement action, or a formal administrative or judicial resolution, regardless of the nature and extent of scientific data available regarding the site. Consequently, valid environmental monitoring data alone, even when submitted by the regulated entity in accordance with state requirements, would not be sufficient absent subsequent state enforcement activity or litigation of some kind. This interpretation of Section 8002(o)(4) is unreasonable because there is no demonstrated nexus between a state decision to commence an enforcement action and the "documentation" or "proof" of environmental damage required by the statute. Indeed, EPA routinely accepts monitoring data alone as evidence of environmental damage in other RCRA contexts. (EDF00021)

In addition, requiring "litigation or a state enforcement action" presumes a violation of law has arisen which should trigger such an action, and the state is willing or able to undertake such action. However, environmental damage has occurred irrespective of the state response, and irrespective of whether the state has standards in place (i.e., groundwater protection standards for the particular pollutants detected in the groundwater) it can claim to be violated. (EDF00021)

Significantly, under comparable statutory direction in Section 8004(m) of RCRA, EPA published a Report to Congress on wastes from the exploration and production of crude oil and natural gas, where the test of proof for scientific investigation allowed for the use of environmental monitoring data only. (EDF00021)

In sum, there is no statutory, scientific, or policy basis for the overly restrictive scientific investigation test of proof in the current Report to Congress. To the contrary, these tests of proof improperly result in the rejection of reliable data on environmental damage, and thereby invalidate EPA's proposed no-action regulatory determination premised (at least in part) on the purported lack of damage cases. (EDF00021)

The vast majority of scientific investigations and reports that we have seen which document contamination of ground or surface waters from coal combustion wastes have not been part of any litigation or state enforcement action. Yet involvement in such formal actions is a criteria for the "test of proof" utilized in this Report to determine whether damage has occurred. By avoiding discussion of the documented evidence of damage unless this criteria is met, the Report presents a deficient and false picture in which the great preponderance of damage from fossil fuel wastes is presumed not to exist. (HEC00056)

In the Report, EPA failed to examine extensive evidence of contamination from coal combustion waste (CCW). Dozens of cases exist in which CCW has contaminated groundwater above federal and state health and use standards and advisory levels for a wide variety of contaminants including arsenic, selenium, lead, cadmium, chromium, molybdenum, vanadium, boron, sulfates, and chlorides. Yet by utilizing a “test of proof” that went far beyond what is required by law to prove “danger to human health or the environment,” a draft Determination has been made that is oblivious to virtually all instances of damage from CCW. This “test of proof” also rejected numerous scientific articles and reports which have examined reproductive, developmental, hormonal, and health problems caused by CCW in microorganisms, plants, invertebrates, amphibians, fish, reptiles, and mammals. (HEC00332)

USWAG argues that the USEPA has the discretion and authority to define damage cases in just about any manner it wants. It is dealing with “scientific uncertainty” and has the scientific and professional obligation to exercise best judgement and not overstate risks. However, the USEPA also has the scientific and professional obligation to publish a document that does not mislead either Congress or the public by understating the risks. And, since the existing criteria unquestionably will fail to include known examples of gross environmental damage and destruction of water resources, they are misleading and, therefore, inappropriate. (GHIL0012)

Cases of environmental damage do not typically reach a courtroom in the United States. Most are resolved by settlement, negotiation, or arbitration. Fewer still are cases in which CCW contamination at a disposal site end up in court. The courts generally deal with either agency lawsuits of an operator who will not co-operate or in cases of disputed liability among multiple parties. CCW is overwhelmingly disposed on the property of the generator and there are seldom questions of responsible parties. CCW contamination issues, when they arise, are generally handled administratively with the regulatory agency, not through court action. Thus requiring a court finding or court ordered action effectively eliminates most of the known CCW problem sites. (GHIL0012)

For the USEPA to move away from this requirement does not immediately subject a damage assessment to the realm of rumor or anecdote, as suggested by USWAG. All that needs to be done is to expand the criteria to include evidence derived from the regulatory agencies collecting the information and/or requiring administrative action. Damage that is documented using agency protocols within agency monitoring programs is damage that should be inventoried and reported to Congress and the public. Site which are under some form of agency compliance action should a prior be considered damage cases. Presently the individual state agencies are the regulatory authorities, and if an agency identifies environmental damage sufficient to cause action, it should be inventoried and reported to Congress and the public. Finally, for those sites which are not subject to monitoring by a state agency (and disturbingly that is not a rare situation), any data collected using protocols at least equivalent to agency protocols and assessed as damage using appropriate and valid scientific methodologies should be usable to document damage, and such damage should be reported to Congress and the public. (GHIL0012)

EPA's policy decision to accept as "damage" cases for inclusion in the Report to Congress pursuant to 42 U.S.C. § 6982(n)(4), only cases in which an enforcement action or other litigation has been brought, rather than documented cases of actual physical damage to the environment for which an enforcement proceeding has not been initiated, is contrary to legal authority and precedent. (ALA00292)

It should be noted that in other Bevill waste contexts, EPA policy has been to accept published scientific studies demonstrating damage to human health and environment as "damage cases" pursuant to the Report requirements listed above. That is, it has been sufficient for EPA's purposes, and taken as proof of damage, that scientists have studied and proved to the satisfaction of peer-reviewers that such damage has occurred. However in the present case, for co-managed fossil fuel wastes, EPA has declared that it will accept only those cases which have been litigated or in which enforcement actions have been formally brought as "damage cases" for consideration in making its Regulatory Determination whether and how to regulate these waste under Subtitle C of RCRA. This means that the damage case analysis included in this Report to Congress is wholly inadequate. (ALA00292)

EPA has also rejected the grand majority of evidence of contamination from CCW due to a "test of proof" that is far more strict than what is required by law and what EPA has used in other reports. As a result, the report whitewashed the real threat posed by CCW. (SIERRA00278)

U.S. EPA should base its recommendations and decisions not on risk assessment or a harsh interpretation of "test of proof", but on the precautionary principle, assuring that there will be no adverse effects to public health and the environment associated with disposal of CCW. (CITZ00358)

We believe that EPA generally established an appropriate basis for identifying documented cases of environmental damage. The 'tests of proof' standards are generally sound except where EPA relied on an out-of-court settlement. Such settlements are often agreed to as a means of avoiding costly litigation and frequently these settlement specifically state that they do not constitute an admission of fault or liability. Therefore, EPA should not consider a site at which there was a settlement as a proved damage case. In any event, we do agree with EPA's additional requirement that the proof must show that FFC wastes were not only present, but clearly implicated, in the reported damage." (USWAG00037)

EPA has properly discharged its duty under the Bevill Amendment to identify and study "documented damage cases in which danger to human health or the environment from surface runoff or leachate has been proved." EPA's methodology for addressing this legislative criterion is set out in the Report to Congress as well as in the Damage Case Background Document. Despite the criticism of some environmental groups that EPA failed to conduct a proper damage case analysis (see EDF Comments at 8) EPA should be confident that its approach (except in its reliance on out-of-court settlements) is fully consistent with the two elements prescribed in the

statute - (1) proven cases that (2) document damage to human health or the environment from runoff or leachate. So long as EPA provides such an explanation in its regulatory determination, its methodology should easily withstand judicial scrutiny under the familiar Chevron doctrine for statutory interpretation. (USWAG00275)

The "ocumented damage case directive" is clear in its general intent that EPA must not consider every speculative claim of damages. However, the implementation of this directive requires EPA to exercise its discretion to determine when a given damage claim constitutes a "documented" and "proven" case. EPA devised a reasonable standard for documentation and a sound methodology for differentiating "proven" from "unproven" cases of documented damage. EPA's methodology - consideration of "tests of proof" - is a reasonable, systematic way to address the ambiguity. These tests require documentation through scientific investigation, administrative rulings, or court decisions. In so doing, EPA chose to rely upon scientific investigations, administrative rulings, and court decisions to screen speculative from real damage cases worthy of consideration pursuant to congressional intent. (USWAG00275)

In implementing the highly complex subject matter under its jurisdiction, EPA is constantly faced with scientific uncertainty. The determination of which level of uncertainty can be accepted in a proven damage case is within the agency's discretion. EPA has set forth a clear methodology for categorizing damage cases as proven or unproven and has consistently employed that methodology throughout the study. Not only is EPA's approach reasonable within the context of the wastes under consideration, but it is entirely consistent with the Agency's approach to consideration of damage cases in other Bevill studies. An agency's interpretation of a legislative directive is given substantial deference, particularly where its interpretation is longstanding and consistent. (USWAG00275)

EDF implies that EPA has not interpreted the Bevill proven damage cases criterion consistently, but the lone example provided - the 1987 Report to Congress on oil and gas wastes - is deceptive. EDF claims that EPA employed a more liberal "scientific documentation" test that did not require the initiation of enforcement action. EDF Comments at 11. However, EPA simply stated that "in some cases" it considered the results of technical tests "conducted with State- approved quality control procedures." The sound exercise of discretion in 1987 to supplement the more rigorous standard of proof for identifying damage cases does not require the Agency to rely on unproved allegations of damage lacking rigorous quality control procedures or formal adjudication. (USWAG00275)

There is no merit to EDF's claim that EPA's rationale for rejecting some alleged damage cases is "legally deficient or otherwise inappropriate." EDF Comments at 9. In another attack on the "tests of proof", EDF falsely implies that EPA is legally bound to weigh Bevill damage cases by the same standard used in other RCRA proceedings, including hazardous waste delisting petition proceedings. Id at 10. EDF falsely implies that there is an agency-wide standard for consideration of damage cases that would be applicable in this context. However, the issue of determination of

“proven damage cases” is relevant only in the context of Bevill determinations, since it is the result of the statutory directive. Whereas EDF believes damage cases should not be tied to enforcement actions (*id.* at 10) EPA determined that such proceedings provide the requisite level of proof, the element specified in the Bevill Amendment but not in other parts of RCRA. EPA, rather than EDF, is entrusted with interpreting the language of the Bevill Amendment, and it has done so reasonably and consistently. (USWAG00275)

EPA notes that for the FFC waste study, it employed a fourth test. That test - that the damages must be attributable to FFC wastes (2 RTC at I-9) - is clearly required by the plain meaning of the Bevill Amendments directive to study “the adverse effects on human health and the environment, if any, of the disposal and utilization of” FFC wastes. See RCRA § 8002(n), 42 U.S.C. § 6982(n). The statute makes clear that EPA must determine which adverse effects are caused by FFC wastes and not attribute to FFC wastes the impacts of other wastes. There is no room or need for interpretation of this clear statutory directive. (USWAG00275)



**XIX. DAMAGE CASES**  
**C. Evidence of Comanagement**

One public interest group commenter stated that EPA wrongfully rejected damage cases simply because evidence of comanagement was not available in state files, without adequate, independent efforts to verify whether comanagement took place.

Response: The Agency attempted to verify all relevant facts, circumstances and conditions that it could investigate for each candidate damage case with available resources in the schedule allotted to conduct the study and formulate the regulatory determination. This includes issues and questions concerning the comanagement of electric utility coal combustion waste.

**XIX. DAMAGE CASES**  
**C. Evidence of Comanagement**  
**Verbatim Commenter Statements**

The damage case analysis performed for both Reports to Congress is wholly inadequate. In supplementing the record for the current Report to Congress, commenters will likely find sites where specific evidence of electric utility coal combustion waste co-management is not expressly identified in state files, because co-management is the norm in the industry so permit terms or other relevant documents do not address the activity in any detail. (EDF00021)

EPA should not fail to consider otherwise documented damage cases simply because co-management is not explicitly documented at these sites, given co-management is the norm and state files may not contain information related to the nature and extent of waste co-management at a particular site. Such lack of consideration would be particularly inappropriate if EPA failed to conduct follow-up with the companies operating these sites, using Section 3007 and other information-gathering authorities, to request any documentation or confirmation of co-management the Agency may require. If EPA is provided substantial information regarding potential damage cases the Agency must bear some responsibility to fill in the remaining data gaps it believes remain. (EDF00021)

EPA wrongfully rejected damage cases where documentary evidence of waste co-management was unavailable in state files ... EPA staff have indicated orally that damage cases would be rejected where evidence of co-management of high and low-volume coal combustion wastes is not expressly provided. Since both EPA and the industry believe CCW waste co-management is by far the prevailing industry practice, and EPA admits the physical and chemical characteristics of co-managed low and high-volume wastes are very similar to high-volume wastes managed alone, documentation of co-management is irrelevant and unnecessary, particularly where states do not expressly require paperwork detailing the variety of wastes that may be managed in CCW units. Moreover, if EPA is provided substantial information regarding potential damage cases the Agency must bear some responsibility to fill in the data gaps it believes remain. EPA should employ its Section 3007 and other data gathering authorities to obtain the relevant information from the companies themselves. (EDF00021)

## **XIX. DAMAGE CASES**

### **D. Consideration of Secondary Parameters**

Public interest group and citizen commenters stated that EPA wrongfully rejected cases of ground-water contamination demonstrated by elevated concentrations of secondary parameters. One of the commenters stated that some state agencies (e.g., Wisconsin) require monitoring for secondary parameters only and use these parameters as an indicator that problems are occurring. An industry commenter, on the other hand, stated that treatment of exceedences of secondary drinking water standards (particularly for sulfate) as damage cases would be inappropriate, because these standards address contaminants that primarily affect the aesthetic qualities relating to public acceptance of drinking water and are not legally binding or federally enforceable.

Response: Our damage case analysis drew a distinction between primary and secondary MCL exceedences because we believe this factor is appropriate in weighing the seriousness of FFC damage in terms of indicating risk to human health and the environment. For FFC, in the RTC, we reported only the “proven” damage (i.e., exceedence of a health-based standard such as a primary MCL and measurement in ground water or surface water). Unlike the primary MCLs, secondary MCLs are not based on human health considerations. (Examples are dissolved solids, sulfate, iron, and chloride for which ground water standards have been established because of their effect on taste, odor, and color.) While some commenters believe that elevated levels of some secondary MCL parameters such as soluble salts are likely precursors or indicators of future hazardous constituent exceedences that could occur at coal combustion facilities, we are not yet able and will not be able to test their hypothesis until we complete our analysis of all comments received on our groundwater model and risk analysis, which will not be concluded until next year.

In formulating the regulatory determination, EPA also relied on the potential damage cases that were identified in the docket supporting the RTC and also the potential damage cases that were identified from the candidate damage cases submitted by commenters. This reliance on potential damage cases that involve secondary MCL exceedences and exceedences of primary MCL in ground water beneath or near the waste source is explained at the beginning of this section.

**XIX. DAMAGE CASES**  
**D. Consideration of Secondary Parameters**  
**Verbatim Commenter Statements**

EPA wrongfully rejected cases of groundwater contamination demonstrated by elevated concentrations of secondary parameters EPA apparently rejected damage cases where the detected pollutants in the groundwater were not those for which primary federal or state drinking water standards had been issued. According to EPA, “danger” to the environment is unproven where a groundwater resource is rendered unusable as a drinking water source because of the presence of secondary drinking water parameters, such as sulfates, chlorides or total dissolved solids. This EPA reasoning is also misguided and in conflict with prior Reports to Congress. The environment is clearly harmed where a pristine aquifer is rendered unusable. Ironically, EPA's drinking water program recognizes such harm since the regulation of underground injection by that program is expressly designed to protect “underground sources of drinking water (USDWs). USDWs are defined to aquifers sufficiently large to supply a public water system and which currently supplies human drinking water or contains fewer than 10,000 mg/l total dissolved solids. (EDF00021)

In the Oilfield Waste Report to Congress, EPA included damage cases even though the contaminants of concern lacked primary MCLs ... EPA has historically considered groundwater and drinking water “damaged” due to elevated levels of chloride and conductivity and EPA has relied upon its secondary drinking water quality standards to ascertain whether such damage has indeed occurred.(EDF00021)

In addition, the secondary parameters are frequently employed as indicator parameters by state regulatory agencies as evidence of groundwater contamination, to avoid more expensive metals sampling and analysis (i.e., groundwater monitoring requirements in Wisconsin for ash disposal units). Therefore, while there is no state standard governing the secondary parameters, the groundwater monitoring program is designed so that these parameter exceedences are considered evidence of groundwater contamination, and thus environmental damage. By insisting upon primary MCL violations, EPA makes no allowance for state programs where groundwater monitoring is reliant, in whole or in part, on detecting the secondary parameters. (EDF00021)

Constituents in coal ash that have caused such damage include sulfates, boron, TDS, sodium, chlorides, fluorides and pH. In many cases these constituents have made potable ground waters well offsite virtually unusable ... The “burden of proof” EPA used for its determination excludes all but a few cases of where CCW has caused significant damage to groundwater sources. Groundwater is a valuable resource throughout the country. Yet, EPA does not consider the dozens of cases where CCW has rendered groundwater useless to be damage cases. (HEC00056)

To limit the definition of a damage case to the eight RCRA metals with MCLs ignores dozens upon dozens of cases of contamination from CCW on two fronts. First, CCW routinely contaminates ground water and surface water to levels beyond any possible use (except, I suppose, fire

suppression) on the basis of other constituents, regardless of RCRA metals concentrations ... Contaminants on these sites that render water useless, independent of RCRA metals concentrations, routinely include sulfate, boron, sodium, iron, manganese and total dissolved solids. There may not be MCLs for all these contaminants, but there are health based concentration and exposure limits that are recognized, or there are environmental damages associated with them, regardless of human exposure limits. Less commonly, but occasionally documented, are compounds such as phenols and chlorinated solvents. Some are almost certainly due to co-management of the wastes. Some may be rarely documented because they are rarely required to be analyzed. But, the damage is damage and should be inventoried as damage prior to any regulatory determination. (GHIL0012)

The state agencies responsible for managing this material at present fully recognize the damage CCW does to water and the environment that is absolutely independent of RCRA metals. This recognition by regulators is so solid that some agencies, e.g. in Wisconsin, do not require analysis for RCRA metals as part of compliance and remediation monitoring. In order to save the facility operator money, only the “biggies” need be monitored. The agency doesn’t need RCRA metals concentrations to define a violation of standards, doesn’t need RCRA metals concentrations to generate a compliance order, doesn’t need RCRA metals concentrations to delineate the problem, and doesn’t need RCRA metals concentrations to determine whether remediation is being effective. And yet USWAG would argue that without RCRA metals concentration, there is no damage that should be reported to Congress or the public. Such a position is absurd. (GHIL0012)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (KYC00285)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00286)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00287)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00289)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00290)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (NCSEA00334)

EPA has correctly focused on constituents for which there is an established National Primary Drinking Water Standard. It would be inappropriate for EPA to determine whether a waste should be regulated as hazardous under RCRA Subtitle C based upon criteria that are not designed to reflect human health. Pursuant to the Safe Drinking Water Act ("SDWA"), 42 U.S.C. 3 300f et seq., EPA is responsible for establishing concentration limits for contaminants in drinking water that "may have an adverse effect on human health". See 42 U.S.C. § 4009-l(b). The National Primary Drinking Water Standards contain the limits EPA has deemed appropriate after study and review by the Office of Groundwater and Drinking Water. Those standards represent the Agency's expert determination whether a constituent poses a significant threat to human health. The Secondary Drinking Water Standards, on the other hand, address "contaminants in drinking water that primarily affect the aesthetic qualities relating to the public acceptance of drinking water." 40 C.F.R. § 143.1. Those regulations are not legally binding or federally enforceable but are intended as guidelines to the States. (USWAG00275)

Sulfate in particular is a potential contaminant to drinking water that has been observed at some FFC waste management sites. However, EPA has not determined that sulfate presents a threat to human health. Sulfate in drinking water has a secondary maximum contaminant level (MCL) of 250 milligrams per liter (mg/L), based on aesthetic effects (i.e., taste and odor). 40 C.F.R. § 143.3. EPA estimates that about 3% of the public drinking water systems in the country may have sulfate levels of 250 mg/L or greater. (USWAG00275)

The SDWA requires EPA, in cooperation with the Centers for Disease Control and Prevention ("CDC"), to conduct a comprehensive study to establish a reliable dose-response relationship for the adverse human health effects from exposure to sulfate in drinking water, including the health effects that may be experienced by sensitive subpopulations, such as infants and travelers. SDWA § 1412(b)(12)(B), 42 U.S.C. 5 300g-l(b)(12)(B). The SDWA specifies that the study must be based on the best available peer-reviewed science and supporting studies, conducted in consultation with interested States. It would be premature and improper for EPA to base a regulatory determination to impose Federal hazardous waste regulation on secondary drinking water standards that Congress has determined are mere aesthetic guidance and not federally enforceable. Although there has been speculation that there may be concerns for public health related to concentrations

far in excess of the secondary standard, the Agency's water experts do not consider the current state of knowledge sufficient to warrant additional controls. (USWAG00275)

## **XIX. DAMAGE CASES**

### **E. Adequacy of Study**

Public interest group commenters stated that EPA's damage case investigation was inadequate in that EPA visited only five states and failed to use its Section 3007 authority to collect more information. Four commenters also argued that EPA inappropriately rejected cases because of the lack of adequate monitoring data, but that the lack of this data is an artifact of inadequate state regulation of these waste sites. Some of these groups and a number of citizen commenters argued that EPA's damage case analysis relied too heavily on data submitted by industry. Many of these commenters urged additional study to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage.

Response: EPA believes its investigation of damage cases was adequate and sufficient to fulfill the RCRA statutory factor concerning identification of instances where the wastes pose a danger to human health or the environment.. EPA visited five states to gather specific information about state regulatory programs, FFC waste generators, waste management practices and candidate damage cases related to fossil fuel combustion. The five states we examined in great detail were: Indiana, Pennsylvania, North Carolina, Wisconsin, and Virginia. We also conducted additional information collection and analysis activities in support of damage case identification, as described at the beginning of this section.

While the Agency's damage case investigation was somewhat limited, these five states account for almost 20 percent of coal-fired utility electrical generation capacity. This is significant sample of the entire U.S. coal burning capacity. The Agency chose not to rely on its RCRA Section 3007 authorities because it decided that communication with state offices and officials was the most efficient means for identification of damage cases.

The damage case investigation did not rely on industry identification of damages, but rather on information collected by state and federal government regulatory agencies. EPA expanded its investigation to include those candidate damage cases that were submitted by public interest group commenters, as discussed at the beginning of this section.



**XIX. DAMAGE CASES**  
**E. Adequacy of Study**  
**Verbatim Commenter Statements**

The damage case analysis performed for both Reports to Congress is wholly inadequate ... Indeed, we note EPA relies heavily upon an EPRI survey of co-management practices, in lieu of information from state files even where EPA staff/contractors visited the states, because data on co-management are often unavailable in state records. (EDF00021)

Unfortunately, despite its importance, EPA failed to conduct a proper damage case analysis. First, EPA only visited five states, and then failed to supplement these state visits with other meaningful data gathering activities in the remaining jurisdictions, therefore the scope of the evaluation was extremely and unduly limited. (EDF00021)

For other waste studies, and in listing determinations, EPA routinely solicits the information necessary to identify damage cases from the regulated community using its authorities under Section 3007 of RCRA. Questionnaires are distributed, requesting specific information on groundwater and surface water releases. The information is then entered into a data base and assessed for possible follow-up investigation work, thereby enabling EPA to target available damage evaluation resources. EPA's failure to utilize its Section 3007 authorities for the current Report to Congress is indefensible. (EDF00021)

Prior to a final regulatory determination, EPA must undertake a more comprehensive damage case evaluation. If a questionnaire is not employed, EPA must make the necessary funds available to conduct a comprehensive damage case review. (EDF00021)

According to the industry data provided to EPA, fewer than half of the coal combustion waste surface impoundments are subject to groundwater protection standards, some of the units subject to these standards are not even required to conduct groundwater monitoring, and the consequences of violating the groundwater standards are unclear in the event violations would be detected at the remaining facilities. See Report to Congress at 3-34. Therefore, under EPA's misguided reasoning, no matter how much contamination is caused by these surface impoundments, in a majority of potential instances impoundment-caused groundwater contamination could not qualify as a damage case because no state law is violated as a result of such contamination. (EDF00021)

The Report is devoid of discussion of the dozens of cases of contamination and damage to the environment throughout the country from disposal of coal combustion and other fossil fuel wastes, many of which pose danger to human health. Every one of these is documented by state and/or federal agencies. The failure to present this evidence amounts to an egregious failure to address the third study factor. This appears to have been a deliberate deficiency designed to support the conclusions of minimal risks in the risk assessments underlying the Report. (HEC00056)

Throughout the report, EPA relies heavily on the industry this determination will effect to supply the information that EPA uses to form its opinion on CCW. The discussion of environmental controls at CCW disposal sites and the search for damage cases are just examples of this problem ... When working to identify damage cases, EPA again relied heavily upon EPRI as a source. To expect utilities to voluntarily supply information that would leave them open for enforcement action or liability is absurd. EPA needs to do its own research and further investigation of sites supplied by both EPRI and other sources to determine if information does indeed exist that would validate cases of CCW contamination as damage cases under the "test of proof". EPA must gather its own data and verify the validity of information received from private sources to make definitive judgements and meet the burden of proof under RCRA for this determination. (HEC00056)

In the Report, EPA failed to examine extensive evidence of contamination from coal combustion waste (CCW). Dozens of cases exist in which CCW has contaminated groundwater above federal and state health and use standards and advisory levels for a wide variety of contaminants including arsenic, selenium, lead, cadmium, chromium, molybdenum, vanadium, boron, sulfates, and chlorides ... The lack of independent information gathering on the part of EPA contributed to the small number of damage cases in the report. EPA relied heavily upon industry to supply the information used in the report. Furthermore, this information was only requested on a voluntary basis. Evidence of contamination from UCCW opens a utility up to litigation, remediation costs, fines, and more costly disposal regulations. Therefore, supplying this information to EPA poses a clear cut conflict of interest for groups such as the Electric Power Research Institute (EPRI) and Edison Electric Institute (EEI). (HEC00332)

Due to EPA's small amount of independent data gathering, HEC was compelled to perform its own damage case search. In addition to the 22 cases HEC submitted to EPA before and during the original comment period, we have since located over 34 new cases of contamination in 14 states. During the period between the close of comments in June and the end of the three-week, new-comment period on September 24, 1999, HEC has had one employee working full-time on identifying new damage cases and a consultant working part time reviewing data as it has been produced. It is not the level of effort that should be devoted to the problem. But, it is a level of effort beyond that which HEC can afford and which has relied upon extensive donations of time and materials from concerned individuals. These comments are based upon that effort. It is an effort that is not complete, and is, in fact, just scratching the surface of the problem. In many cases, these sites are not part of any database of contaminated sites or are not listed as CCW disposal sites on such databases, and our contacts within the state agencies most often learned of these cases through word of mouth within the agency. EPA's search of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Information System would not have found the majority of contamination cases located by HEC. (HEC00332)

Nonetheless, EPA's search of the CERCLA Information System does not appear to be very thorough. HEC located two Superfund sites where CCW has been documented to be causing

contamination that are located on the CERCLA list: the Dixie Caverns County Landfill in Virginia and the Vitale Fly Ash Pit in Massachusetts. While several different types of waste were disposed at these sites in both cases, EPA reports contamination occurring that is clearly linked to fly ash. Yet, these sites were not considered in the report as damage cases. (HEC00332)

The process of documenting environmental or resource damage from the disposal of CCW is further handicapped by HEC's outsider status. There is little motivation for state agencies to expend time, energy and resources helping an environmental organization from another state obtain data for purposes that bear no discernible benefit to the agency. An equivalent search program by the USEPA, or its designated contractor, would unquestionably produce quicker and more thorough results with fewer iterations. It is a search program that should have been undertaken, and still should be undertaken, by the Agency before any determination for these wastes occurs. An addendum to the Report to Congress should be issued to reflect the results of the search and document the true levels of damage resulting from current disposal practices and lax oversight by many state agencies. (HEC00332)

The following data summarizes the data presently available to HEC as a result of its search efforts. Less than full documentation of damage at a site, or even conditions at a site, does not indicate that documenting data do not exist. It indicates only that the search program has not yet been able to obtain such data. Regardless of whether HEC is able to complete this search, it is incumbent upon the Agency to pursue additional documentation to provide an accurate and complete assessment of damages to Congress and the public potentially affected by this determination. (HEC00332)

The absence of a site from a particular state does not mean there are no problem sites within that state. It indicates only that the HEC search program has not yet approached that state or has not yet identified within the state the appropriate information contacts. Similarly, the absence of contamination by specific CCWs or specific disposal scenarios in a given state is not evidence that such contamination does not exist. It may be a waste that is not subject, in that state, to monitoring that would detect contamination (e.g. fly ash disposal in Indiana, where only FGD requires monitoring). It is incumbent upon the Agency to pursue damage cases in additional states and additional damage cases in these aforementioned states before it makes assertions regarding the frequency or degree of damage from current CCW disposal practices. (HEC00332)

Failure to monitor many CCW disposal sites and types of CCW contamination underestimates the magnitude of the problem. As we have already pointed out, most large scale CCW disposal sites have no ground water monitoring. And many of those that do have monitoring provisions are only analyzing for a few parameters in ground waters affected by CCW. (HEC00332)

Using the very restrictive criteria of the Report to Congress, the USEPA listed only six damage cases nationwide ... One of the curiosities of this research is that sites analyzed by the USEPA itself as endangering human health and safety due to CCW disposal did not make the list of six. (GHIL0012)

Finally, for those sites which are not subject to monitoring by a state agency (and disturbingly that is not a rare situation), any data collected using protocols at least equivalent to agency protocols and assessed as damage using appropriate and valid scientific methodologies should be usable to document damage, and such damage should be reported to Congress and the public. (GHIL0012)

The Report to Congress considers the number of damage case it lists relative to the number of disposal sites in the country, with the implication that all sites not on the list are proven not contaminated, or at least not damaged. One of the interesting insights that has come from the HEC research is that not all CCW disposal sites are even monitored. It is a true statement that there is no evidence of water contamination or environmental damage from any fly ash disposal site at any utility in Indiana. It is also a misleading statement. There is no monitoring required around fly ash disposal sites at utilities in Indiana. Based upon similar sites that are monitored in Wisconsin, one should presume that there is comparable damage in Indiana. But, it is true that there is no evidence of that damage today. (GHIL0012)

EPA failed to adequately survey current impacts of FFC wastes. The EPA relies on scant and inadequate monitoring data of groundwater contamination around WMU to ostensibly support the finding that no impact has occurred. (ALA00292)

Unfortunately, EPA has relied heavily upon the very industry it is regulating as the major source of information in the report ... As a result, the report whitewashed the real threat posed by CCW. (SIERRA00278)

The Administrator is empowered by Section 8002(n) [42 U.S.C. 69821, to invite participation by other agencies, industry and the public and to review studies and other action by such parties “as he deems appropriate . . . with a view toward avoiding duplication of effort.” The statute does not, however, indicate that the scope of the Administrator’s study is to be limited to a file review of third-party data. While such data can be reviewed in order to minimize duplication of “effort,” it is clear that the Congress contemplated that independent effort would be expended by EPA in order to produce a “detailed and comprehensive study” of the consequences of management and disposal of material generated from the combustion of coal and other fossil fuels. EPA has chosen to rely almost entirely on data submitted by third parties to support an assessment of whether the risks associated with improper disposal warrant such effort, yet has inexplicably failed to acknowledge the full range of evidence of groundwater contamination associated with current CCW disposal practices. (NCCLP00282)

The HEC comments outline numerous “documented cases in which danger to human health or the environment” has been demonstrated, yet the agency has previously rejected that information because of the absence of pre-disposal background. Much of the information available regarding disposal practices may not conform to laboratory protocols, since the hodgepodge of state controls over the disposal of this waste results, in many case, in disposal without proper characterization of background conditions or the waste stream for those constituents of concern present in this waste.

The rejection of such information as has been developed demonstrating contamination because of questions concerning quality control or background, is an easy but inappropriate response. To the extent that EPA determines that additional “background” or other information is needed regarding any studies submitted documenting contamination, it is obligated to secure that information and conduct further inquiry rather than merely discounting the information. (NCCLP00282)

The lack of background, characterization, hydrologic and other information regarding these past disposal activities, is itself is a product of uneven and inadequate state regulation of the waste stream, and speaks volumes of the need for establishment of a federal “floor” of regulation of coal combustion wastes. (NCCLP00282)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (SIERRA00278)

EPA should gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00256)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00256)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (VWI00258)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (VWI00258)

The EPA must gather its own information on CCW contamination rather than relying only on industry's biased reports, report all cases where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage. (CITZ00260)

I am very concerned by the fact that the EPA relied heavily on the cola industry as a primary source of information in compiling this report, and not enough on other sources. Rather than relying on the blatantly-biased “data” provided by the industry, the EPA needs to uphold its duty as a federal agency to exercise oversight in matters such as these, and to collect its own data. (CITZ00261)

The EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards, or has caused ecological damage. (CITZ00261)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00263)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00263)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00264)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00264)

Rather than rely on industry biased information, EPA should gather its own information in regard to CCW contamination. (CITZ00265)

In making its regulatory determination, EPA should consider all instances in which CCW contamination has exceeded state and federal health and drinking water standards. Additionally, EPA should rely on scientific articles and reports, which document exceedances, which have led to ecological damage from the disposal of CCW. (CITZ00265)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (SAVV00266)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (SAVV00266)

The EPA should be attempting to use its own resources to build a body of empirical evidence regarding coal combustion wastes (CCW's) rather than depending on outside sources. (CITZ00267)

Any documented cases of CCW contamination should be carefully examined by the EPA to determine their impact upon drinking water and fisheries. (CITZ00267)

EPA should make a strong effort to gather its own information on CCW contamination, rather than relying on industry. (SOCM00279)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage. (SOCM00279)

EPA relied heavily upon the very industry it is regulating as the major source of information in the report and it whitewashed the real threats posed by CCW ... EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00284)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health advisories and drinking water standards or has caused ecological damage. (CITZ00284)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (KYC00285)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (KYC00285)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00286)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00286)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00287)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00287)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00289)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00289)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in

scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00290)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00290)

I believe that EPA should ... Make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00291)

I believe that EPA should ... Consider all cases of contamination where CCW has exceeded state and federal health advisories and drinking water standards or has caused ecological damage. (CITZ00291)

Due to the potential long term impacts of CCW burial on groundwater quality and the high cost in terms of funds, man-power, and environmental concerns should CCW's be proven to negatively affect aquifers in which they're buried, I encourage EPA to research or obtain needed unbiased data from independent sources. (PURD00294)

The EPA must develop its own technical background information and not rely only on information supplied by industry. The potential for toxins in the waste will have long-term detrimental effects not only on our environment, but to our own health and the health of our future generations. The EPA must consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards. It is the responsibility of the EPA to make an unbiased evaluation of all of the technical information available. (TRI00295)

I would urge you to collect your own data to confirm this. It would certainly be unwise to rely on the regulated industry for information. (CITZ00303)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00311)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00311)

EPA needs to consider all cases in which contamination from CCW as exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00312)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00312)



EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00313)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00313)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00314)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00314)

I urge you to gather information on Coal Combustion Wastes from independent sources, not sources paid by the coal industry. (CITZ00315)

I also urge the EPA to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage. (CITZ00315)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00316)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00316)

I have been informed that a significant amount of the early studies were based on data supplied by the studies of the industries who would benefit the most from improper disposal of CCBs. Your decision should be, obviously, based on your own data. The information from industry and environmental groups should be taken with a grain of salt - each will present data that support their respective views. (CITZ00317)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00318)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00318)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00319)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00319)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00320)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00320)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00321)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00321)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00322)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00322)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00323)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00323)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00324)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00324)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00325)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00325)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry (CITZ00326)

EPA needs to consider all cases of contamination wheke CCW has exceeded state and federal heath and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00326)

EPA needs to consider all cases in which drinking water standards (state & federal) have been exceeded (violated). EPA should also consider documented scientific articles that cause damage as examples of damage in its regulatory determination. (CITZ00327)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00327)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00331)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00331)

It is also imperative that the EPA not depend upon industry data regarding CCW contamination. There is a likelihood that these numbers are biased in the favor of the interests of polluters. (BUCK00333)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal drinking water standards, secondary use standards or health advisory levels or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (NCSEA00334)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (NCSEA00334)

There are many cases where CCW had caused contamination of drinking water & ecological damage. Please conduct a diligent literature search so past mistakes can be avoided. It is important

for the EPA not rely solely on the information provided by industry, as it is difficult for anyone to provide information detrimental to their own benefit. The EPA should make a strong effort to review information from other sources when making decisions that have the potential to impact seriously current & future generations. (CITZ00335)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00336)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00336)

I urge you to gather information on Coal Combustion Wastes from independent sources, not sources paid by the coal industry. The industry is famous for it's bias, slanted and carefully crafted designed "research" that would pass through NO peer reviews of neutral technical or scientific experts. Many people, homeowners, farmers, and much land have already been greatly harmed because the government agencies have relied on this kind of industry "research". (CITZ00337)

I also urge the EPA to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or has caused ecological damage. (CITZ00337)

Likewise, EPA needs to do an independent assessment of federal and, state health and drinking water standards to learn of they have been exceeded due to CCW contamination. Also, it should seriously consider scientific literature where CCW contamination has been documented as causing damage to the ecology of the areas under study. (CITZ00338)

I strongly believe that, in making its regulatory determination, the EPA needs to do an independent assessment of the following: 1. Those cases in which federal and state health and drinking water standards have been exceeded due to CCW contamination, and , 2. Instances in the scientific literature where CCW contamination has been documented as causing damage to the ecology of the areas under study. (CITZ00339)

I wish to emphasize my belief that the EPA do an independent study instead of relying on data supplied by corporate interests. Simply put, when push comes to shove, I do not trust those folks to put the long-term interest of the public above the short-term interests of the bottom line. (CITZ00339)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00340)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00340)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00343)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00343)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00344)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00344)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00345)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00345)

EPA should gather its own information on coal combustion waste contamination rather than relying on highly biased information supplied by industry. (CITZ00346)

EPA needs to consider all cases of contamination where coal combustion waste has exceeded state and federal health advisories and drinking water standards or has caused ecological damage. (CITZ00346)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00348)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00348)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00349)

EPA needs to consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (CITZ00349)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00350)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00350)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00351)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00351)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00352)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00352)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00353)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00353)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00354)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00354)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00355)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00355)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00356)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00356)

EPA needs to consider all cases in which contamination from CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as examples of damage in its regulatory determination. (CITZ00357)

EPA should make a strong effort to gather its own information on CCW contamination rather than relying on highly biased information supplied by industry. (CITZ00357)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00360)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00361)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00362)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as

well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00363)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00364)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00365)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00366)

If the EPA would gather its own information on CCW contamination and not rely on information supplied by industry, there would be a completely different light shed on the amount of ground water contamination caused by the dumping of fossil fuel waste. The EPA must consider all cases of contamination where CCW has exceeded, state and federal health and drinking standards as well as the documented scientific articles that show ecological damage, as damage cases in its regulatory determination. (CITZ00367)

EPA should ensure the objectivity, accuracy, and completeness of this report by ... gathering its own information rather than relying on highly biased information supplied by the industry and state agencies which behave more as advocates than observers ... considering all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage as damage cases in its regulatory determination. (POW00369)

I hope the EPA will strive to gather its own information on CCW contamination, rather than relying on coal company information. I hope the EPA will consider all cases of contamination where CCW has exceeded state and federal health and drinking water standards or been documented in scientific articles to cause ecological damage. (CITZL0013)



## **XX. ADEQUACY OF STATE REGULATIONS**

Many industry and state government commenters stated that EPA presented an accurate and comprehensive analysis of state regulatory controls and stated that existing regulations are adequate. Several public interest group commenters, however, believe EPA's analysis to be inaccurate and expressed concern about the adequacy of state regulations. These concerns are summarized in more detail below. One public interest group commenter provided information on the environmental controls in place at surface impoundments in Indiana and other states. Several industry commenters and state government provided information on existing state requirements as evidence of the adequacy of these programs.

Response: We believe that state programs have, in fact, substantially improved over the last 15 years or so, as evidenced by the large number of states that have authority to impose protective management standards on surface impoundments and landfills, especially for groundwater monitoring, liners, and leachate collection, which mitigate potential risks posed by these units. In addition, we believe that the trend to line and install groundwater monitoring for new surface impoundments and landfills is positive. However, as some commenters noted, we acknowledge that our state program review looked at the authorities available to states and their overall regulatory requirements, not the specific requirements applied to any given facility, which could be more or less stringent. In addition, we recognize that many individual state programs have some gaps in coverage, as indicated below, so that some controls may not now be required at coal combustion waste impoundments and landfills.

One consistent trend that raises concern for the Agency, and was identified by a number of public interest commenters, is that surface impoundment controls occur at a significantly lower rate than at landfills. Hydraulic pressure in a surface impoundment increases the likelihood of releases; and groundwater monitoring, at a minimum, in existing as well as new impoundments, is a reasonable approach to monitor performance of the unit and a critical first step to addressing groundwater damage that may be caused by the unit. Only 38 percent of currently operating utility surface impoundments have groundwater monitoring and only 26 percent have liners.

While liners and groundwater monitoring are applied more frequently at landfills, there are still many utility and non-utility landfills that do not have liners. In addition, 15 percent of utility landfills do not have groundwater monitoring and some small proportion of non-utility landfills do not have groundwater monitoring.

The utility industry through its trade associations has demonstrated a willingness to work with EPA to develop protective management practices, and individual companies have committed to upgrading their own practices. However, the Agency recognizes the validity of the comment that adherence to voluntary programs is not assured. Also, individual facilities and companies may not implement protective management practices and controls, for a variety of reasons, in spite of their endorsement by industry-wide groups.

We see a trend toward significantly improving state programs and voluntary industry investment in liners and ground-water monitoring that we believe can mitigate potential risks over time. However, we identified significant gaps in controls already in place and, in particular, requirements that may be lacking in some states, either in authority to impose the requirements or potentially in exercising that authority. In response to comments, we further analyzed risks posed by coal combustion wastes taking into account waste characteristics and potential and actual damage cases. Based on these analyses, we concluded that coal combustion wastes have the potential to present danger to human health and the environment and that a number of proven damages have been documented and that more are likely if we had been able to conduct a more thorough search of available state records and if groundwater monitoring data were available for all units. We recognize that there will probably continue to be some gaps in practices and controls and are concerned at the possibility that these will go unaddressed. We also believe that the timeframe for improvement of current practices is likely to be longer in the absence of federal regulations.

## **XX. ADEQUACY OF STATE REGULATIONS**

### **Verbatim Commenter Statements**

Practices are currently subject to industry best management practices and state regulatory controls that are effective. (IEU00018)

we agree with EPA's determination that:

- The electric generation industry has a significant level of installed environmental controls for managing the wastes studied in the Report;
- The majority of states have regulations controlling the management and monitoring of ash management; (PG&E00023)

The Department has worked closely with the Illinois Environmental Protection Agency in implementing the [Illinois Environmental Protection] Act and in our opinion the steps taken by Illinois to address the disposal and use of CCW and CCB preclude the need for federal regulations in this area. (IDNR00023)

The WRAG would like to affirm the majority of conclusions in the Agency's report and fully supports the Agency's position that continued use of site and region specific approaches by states is more appropriate for addressing the limited health and environmental risks that may be associated with the wastes. It has been WRAG's experience that state, county and municipal agencies are fully cognizant of the use of CCBs and provide appropriate oversight of these activities. As each county or municipality has land use regulations or ordinances, these local agencies are best equipped to determine the impact non-hazardous waste activities have on their areas. (WRAG00030)

Continued use of site and region specific approaches by states is more appropriate for addressing the limited health and environmental risks that may be associated with the wastes. It has been our experience that the States of Colorado, New Mexico and Texas, county and municipal agencies are fully cognizant of the disposal of these wastes and provide appropriate oversight of these waste activities. As each county or municipality has land use regulations or ordinances, these local agencies are best equipped to determine the impact non-hazardous waste activities have on their areas. Additionally, state solid waste regulations clearly identify the requirements that solid waste uses, including disposal, must meet and additional regulatory oversight from the Agency is unnecessary. (NCE00031)

The trend among electric utilities is to install more environmental controls at waste management facilities, including liners, covers, and groundwater monitoring. (USWAG00037)

The states have developed a comprehensive body of regulations applicable to the waste management units in which utilities store and dispose of combustion wastes. (USWAG00037)

EPA presented a comprehensive and accurate analysis of existing regulatory controls applicable to co-managed combustion waste management units. (USWAG00037)

The RTC demonstrated that the states in which OCW management units are located typically have comprehensive regulatory programs applicable to these units. (USWAG00037)

APS agrees with the agency that FFC waste disposal is adequately regulated on the state level. (APSC00043)

APS believes the state agencies have the appropriate regulatory structure in place to effectively manage FFC wastes, (APSC00043)

The Agency recognizes the states' ability to regulate FBC ashes, as well as utility and non-utility ashes, in solid waste management's units ... States have the ability to develop effective landfill, mine reclamation, and agricultural programs. These programs are developed within each state and can best reflect their unique environmental factors, social and economic needs. It appears that current regulation of these activities is more than adequate. (ISG00048)

Additionally, MCC feels that the materials discussed in the March 1999 Document are properly and duly regulated at the State level. Any attempt to impose Federal restrictions over and above what the States already impose is inappropriate and an ill-advised attempt to implement a "one size fits all" regulatory approach to materials that are as varied as the sources producing them. (MCC00051)

We do not believe there is any need to develop new national regulations or classifications for industrial combustion ash or by-products from the combustion of oil. We believe current regulations and State management programs are sufficient to protect human health and the environment. (CIBO00052)

Existing state and federal regulatory programs insure the proper management of fossil fuel combustion wastes. (CIBO00052)

State regulatory programs are demonstrably more than adequate to address any risks posed by the use and disposal of CCPs. (WVDEPL0003)

Extensive federal and state regulatory programs currently in place adequately protect public health and the environment from risks from the management of these non-hazardous fossil fuel wastes. (PG&E00274)

EPA correctly reported in the Report to Congress that most utility industry co-management occurs in surface impoundments and landfills, with an increasing trend toward dry landfill management of co-managed combustion wastes as well as a clear trend among these units to increased use of

environmental controls such as liners, covers, leachate collection systems, and groundwater monitoring. (USWAG00275)

Agency deference to regulation exclusively by states, based on alleged trends towards state management practices and the notion that state programs require adequate environmental controls, is misplaced. (ALA00036)

Based on the information presented by EPA in the Report, the existing regulatory controls imposed by the states are inadequate in terms of unit coverage and stringency, they widely variable across the states and are primarily based on permitting policies and not enforceable regulations. (ALA00036)

State regulatory efforts are extremely weak. (HEC00056)

The Report has little discussion of requirements actually in place at lagoons. Its general inferences about those requirements and the retrofitting of lagoons, based once again on information from EPRI, appear to be completely mistaken. (HEC00056)

The information we have gathered in just a short time shows little if any real protection being practiced at these sites. (HEC00056)

The Report's conclusions regarding controls are inadequate ... The Agency seems willing to defer to state regulation of co-managed FFC wastes, citing trends in improvements to waste management facilities. In fact, the "trends" we are aware of show that few if any improvements have been made. For example, in 25 years there has been only a 10 percent increase in the use of lined impoundments. Fewer than one percent of the impoundments have leachate collection systems. Furthermore, the Agency admits that it did not conduct state specific analyses to determine whether states are adequately exercising their authority to regulate the disposal of these wastes. (49CAO00058)

The information provided by the Hoosier Environmental Council in current and past comments, demonstrates the wide variability among states in the caliber of the management programs for coal combustion wastes. (NCCLP00282)

The state capacity to regulate coal combustion waste is not what is at issue. The question is, quite simply, whether the wastes are being properly subject to those controls, and the answer is a checkered one, depending on the political will of the state to impose controls. EPA cannot avoid a determination to manage such wastes by identifying the possibility of state-imposed controls (or other federal controls). (NCCLP00282)

State programs that regulate disposal of coal combustion wastes, CCW, and other fossil fuel wastes are grossly insufficient, particularly with respect to surface impoundments. (HEC00332)

As we have already pointed out, most large scale CCW disposal sites have no ground water monitoring. And many of those that do have monitoring provisions are only analyzing for a few parameters in ground waters affected by CCW ... Whole classes of harmful compounds that should be monitored for around CCW disposal sites are not being monitored for. (HEC00332)

The statements made about the environmental controls at CCW surface impoundments in section 3.3.4 of the Report are very misleading. (HEC00332)

The Report to Congress assumed that the National Pollutant Discharge Elimination System (NPDES) and the setting of the Total Maximum Daily Loads (TMDLs) adequately protected aquatic life in receiving waters. However, this research shows that that is not the case. It shows that ecological damage from surface impoundments has the potential of being a much larger problem. (ALA00292)

Therefore, since ( 1) EPA estimates that 43% of the landfills and 74% of the surface impoundments for FFC waste are unlined (Figure 3-9 in Report to Congress), and (2) according to EPA analysis ground water contamination is expected to occur from uncontrolled WMUs, then unregulated FFC waste pose a potentially significant threat to the drinking water supplies in many states. Although regulations involving the siting, construction, and monitoring of landfills have changed dramatically, it is important to note that past practices continue to cause a threat to ground water quality. Landfills and surface impoundments, in general, have been identified by states as among the top 5 major sources of ground water contamination. (ALA00292)

Although regulations involving the siting, construction, and monitoring of landfills have changed dramatically, it is important to note that past practices continue to cause a threat to ground water quality. Landfills and surface impoundments, in general, have been identified by states as among the top 5 major sources of ground water contamination. (ALA00292)

The effects of the deregulation of electricity sales and its potential to promote unacceptable disposal standards among the states are not recognized or addressed. The Report fails to take into account the effect that an open competitive market in electricity sales may have on disparities in environmental regulation of power plant wastes. If deregulation of electric utilities occurs, utilities in states with responsible disposal standards may face a competitive disadvantage with utilities in states such as Indiana that allow open dumping of power plant wastes into drinking water supplies. Without federal standards to create a level playing field, state may face great pressure to relax their disposal requirements for power plant wastes in order to give their utilities a competitive advantage in selling electricity on the open market. Therefore EPA should consider the effects of deregulation on state programs before making its Final Determination. (HEC00056)

**XX. ADEQUACY OF STATE REGULATIONS**  
**A. Information Provided**

One public interest group commenter provided information on the environmental controls in place at surface impoundments in Indiana and other states. Several industry and state government commenters provided information on existing state requirements as evidence of the adequacy of these programs.

Response: EPA thanks the commenters for the extensive information provided. EPA has carefully reviewed this information, along with the information previously collected in support of the Report to Congress. This results of this review are discussed further in the sub-topic responses below.

## **XX. ADEQUACY OF STATE REGULATIONS**

### **A. Information Provided**

#### **Verbatim Commenter Statements**

Some Indiana CCP landfill sites have undergone or are currently undergoing corrective actions on either a voluntary or a state agency-directed basis. These corrective actions are required by state landfill regulations whenever a release exceeds background concentrations. In some instances old CCP landfills are being capped or leachate is being collected even though these protective measures were not required when the landfills were constructed. Today, any new construction or major modification of CCP landfill is subject to state regulations that require the utilization of liners. At a minimum, all Indiana CCP landfills are being monitored to ensure that any problems are identified in a timely manner. In Indiana, the groundwater monitoring wells at CCP landfills are placed within 50 feet of the solid waste disposal boundary compared to the 150 meters required by federal Subtitle D regulations. In short, Indiana disposal sites are in full compliance with applicable state and federal regulations including, when appropriate, corrective action requirements. (IEU00018)

The following regulations control oil ash management activities at PG&E Gen facilities and require monitoring and/or reporting to the state:

- Massachusetts Site Assignment Regulations (required for siting landfills)
- Massachusetts Solid Waste Regulations
- Massachusetts Groundwater Discharge Permit Regulations
- Massachusetts Groundwater Quality Standards
- Massachusetts Contingency Plan Regulations (in the event of an uncontrolled release to the environment).

Monitoring wells around active landfills monitor groundwater quality on a quarterly basis. (see the solid waste regulations, 3 10 CMR 19.000). Leachate collection is required for landfills because PG&E Gen has disposal units (double lined landfills). Leachate collection is not required for impoundments. (Impoundments are treatment structures, not disposal facilities). EPA does not mention that in Massachusetts, there are groundwater discharge permit regulations controlling unlined impoundments (see 3 14 CMR 5.00). In addition, Massachusetts has regulations on groundwater quality standards (see 3 14 CMR 6.00). Finally, Massachusetts has regulations based on risk: if there is shown to be an unacceptable risk to human health or the environment, then actions must be taken to mitigate the risk (Solid Waste Regulations, 3 10 CMR 19.000; and the Massachusetts Contingency Plan, 3 10 CMR 40.0000). (PG&E00023)

The Illinois Environmental Protection Act (Act) addresses both the disposal of coal combustion waste (CCW) and the beneficial use of coal combustion byproducts (CCB). It defines both terms and stipulates the manner in which each may either be disposed of or used. The Act requires that



CCB not exceed Illinois' Class I Groundwater Standards for metals and that it not be mixed with hazardous wastes prior to use. Concerning CCW, the Act requires that the disposal area be covered and vegetated, be protected from wind and water erosion, and that the pH will be maintained so as to prevent excessive leaching of metal ions, and the disposal plan adequately protect surface water and ground water from contamination. (IDNR00026)

APS would also like to provide additional information for the agency's consideration regarding the regulation of FFC waste disposal in Arizona. The State of Arizona does not exempt FFC wastes from the definition of a solid waste. Consequently, FFC disposal facilities including landfills and surface impoundments are subject to state solid waste regulations. Arizona has also established a complex program designed to protect the quality of groundwater in the state. The Aquifer Protection Program (APP) requires a permit for any facility with a potential to discharge to groundwater including landfills and surface impoundments. The APP program establishes a "point of compliance" for each permitted facility, and each facility is required to monitor groundwater quality at that point. In addition, each permit establishes alert levels, reporting requirements, and contingency plans that must be implemented in the event of a violation. (APSC00043)

We therefore decided to conduct a survey of Indiana surface impoundments to determine how much improvement in environmental protection at these facilities has been made ... We are gathering our information from both the National Pollution Discharge Elimination System (NPDES) permits for Indiana surface impoundments and the state inspectors who monitor these sites ... We can locate no evidence of constructed liners or ground water monitoring at any of the surface impoundments. The only parameters covered by the NPDES permits that had regulated limits were total suspended solids (TSS), oil and grease, and pH. Copper and iron are only regulated when the plant's turbines are cleaned. Boron, which an Indiana inspector stated should be expected to be a problem almost anywhere you store coal ash, is not regulated at any of these sites. These permits are also not categorized in an accessible form. A list of power plant surface impoundments is not even available at the Indiana Department of Environmental Management, IDEM. Gathering information about these sites requires hours of sorting through IDEM's files of the power plants in Indiana. (HEC00056)

At some sites other parameters are monitored. These include arsenic, lead, cadmium, chromium, and zinc. However, there are no enforceable limits on any of these contaminants so contamination can exceed drinking water standards by several times with no action being taken. Furthermore the permits only require monitoring to be done for these parameters for six to twelve months from the beginning of the permit. Provisions are made in the permit to set limits on these parameters if "significant quantities" of these contaminants are found. But there is no clarification of what "significant quantities" means, and IDEM's permit writers within the Office of Water Management are currently under strict orders not to modify any existing permits. For the past few years, due to a backlog in new permits, they have only been focusing on issuing new permits ... We have tabularized the results of our survey to date as follows ... [comment provides a table of

impoundment controls at surface impoundments in Indiana] ... One site on the table is of special note. The Michigan City impoundment has recorded arsenic levels in downgradient groundwater of up to one hundred times the federal drinking water standards. Yet arsenic levels are not monitored for at this site. (HEC00056)

In the past six weeks HEC has conducted a state by state survey of CCW surface impoundments in Ohio, Kentucky, Georgia, Illinois, Missouri, Texas, Iowa, South Carolina, and Alabama. We asked each state how many sites had liners and groundwater monitoring, and if any of the impoundments had a history of contamination. As with Indiana, in all of these states there is no database operated by the relevant regulatory agency showing which sites are lined or have groundwater monitoring. Information had to be gathered through personal knowledge of the inspectors of each site or our contacts within each state examining the files. Overall, only Illinois appears to have made any progress towards lined surface impoundments. Of the ten states surveyed, only Illinois, South Carolina, and Alabama have established groundwater monitoring at most of their impoundments. Not surprisingly, all nine new contamination cases that we are turning in from these states in these comments are occurring at surface impoundments. This would indicate that at many surface impoundments that do not have groundwater monitoring, groundwater contamination may be occurring undetected. Our contact in the Alabama Department of Environmental Management was told by one of his staff geologists that without question that sites without a liner will leach metals into the ground. Brunning et al (1994) also states in reference to CCW disposal sites "any failure of confinement technologies at disposal sites would adversely affect both the chemistry and microbiology of the underlying saturated zone." (see attachment 1) (HEC00056)

The EPA's draft Report declares that the movement from unlined to lined impoundments is concentrated in Georgia, Illinois, Indiana, Kentucky, Missouri, and Texas and that all surface impoundments in these states built after 1982 have liners. Yet in the case of Texas, the Natural Resource Conservation Commission does not require a regulatory permit for any onsite CCW disposal facility. In Georgia and Indiana, no surface impoundments have been built since 1982, and none of the impoundments in these states are lined. Kentucky regulators know of no lined lagoons on their state, and Kentucky law requires no groundwater monitoring at lagoons. In Missouri, two new surface impoundments are lined. However, Missouri law only allows surface impoundments as storage for CCW, and liners are not required. Liners were installed at these two sites by a utility attempting to gain permanent disposal sites ... [comment provides several pages summarizing state regulatory controls at impoundments]. (HEC00332)

## **XX. ADEQUACY OF STATE REGULATIONS**

### **B. Characterization of State Regulations Incomplete or Inaccurate**

A public interest group commenter argued that EPA's analysis of state regulations was founded only on whether the states have the capacity to regulate FFC wastes and should have considered whether the wastes are being properly subjected to the controls. Several other public interest group commenters stated that EPA's investigation of state regulations was insufficient because it covered only a few states in detail. The commenters also stated that the presentation of trends in state regulation and environmental controls in management units was incorrect, misleading, or overly generous. One industry commenter, on the other hand, argued that the Agency accurately characterized a trend toward dry landfill management and toward increased use of environmental controls. Another industry commenter stated that EPA's characterization of Massachusetts' regulations was incomplete. The commenter stated that the State's regulation of its facilities are more stringent than characterized by EPA.

Response: The Agency believes that its investigation of state regulations was sufficiently complete and adequate to support its regulatory determination. Survey data were available for nearly all 50 states. The case study states reviewed in detail by EPA represent from 20 to 60 percent of electrical generating capacity depending on the FFC waste sector. EPA's characterization of surface impoundment regulatory requirements is based on two independent surveys of requirements in a number of states (50 states were surveyed by the Association of State and Territorial Solid Waste Management Officials, 30 states were surveyed by the Council of Industrial Boiler Owners) and information for more than 100 surface impoundments provided in an industry survey. EPA's characterization of regulatory requirements in the 10 states surveyed by the commenter does not differ dramatically from the commenter's characterization. Both characterizations show that these 10 states require controls on a case-by-case basis.

As commenters noted, we acknowledge that our state program reviews looked at the authorities available to states and their overall regulatory requirements, not the specific requirements applied to any given facility, which may be more or less stringent. In addition, while we believe that there is a positive trend, both in the protectiveness and level of coverage of state programs and in the application of controls at individual units, we agree the trends cannot be looked at separately from the larger picture of how many facilities actually apply controls.

We found that more than 40 states have the authority to require liners and ground-water monitoring at surface impoundments and landfills. We also found the following:

- Of 20 surface impoundments opened since 1985, 65 percent monitor ground water, 60 percent have liners and ground-water performance standards, and 5 percent have leachate collection systems;

- Of 34 landfills opened since 1985, 88 percent monitor ground water, 85 percent have ground-water performance standards, 75 percent have liners and 56 percent have leachate collection.

We agree that we must also take into account the less positive trend that over a 20-25 year period, as some commenters pointed, out ground-water monitoring and the use of liners at utility surface impoundments has increased only about ten percent. There is sufficient evidence that there are and are likely to continue to be gaps in the protective controls that are actually applied at these units.

As we weighed all the information that was available to us on the coverage of and improvements in state programs, controls currently in place at units, and the actual and potential damages that may be associated with coal combustion wastes, we are concerned that the timeframe for improvement is likely to be considerably longer in the absence of federal regulations.

**XX. ADEQUACY OF STATE REGULATIONS**  
**B. Characterization of State Regulations Incomplete or Inadequate**  
**Verbatim Commenter Statements**

EPA mentioned numerous state and federal regulations pertaining to electric generating facilities, yet not all of the regulations pertaining to ash management in Massachusetts were described or listed in this section ... Clearly, these activities are closely regulated by appropriate agencies that know and understand the regional issues, geologic setting, and hydrogeology. (PG&E00023)

EPA presented a comprehensive and accurate analysis of existing regulatory controls applicable to co-managed combustion waste management units. (USWAG00037)

The Agency cites “trends” in liner use at manages. lent units, yet examination of the data presented (in only graphical, not tabular form - see figure 3-8) reveals that over a 35 year period, there has been only a 2.5 percent increase in liners at landfills and barely a ten percent increase in liners at impoundments. In addition, the EPRI survey indicates that there is no trend towards using leachate collection systems in new units compared to old units. The end result of this supposed increased oversight by state agencies is that less than one percent of the impoundments have leachate collection systems, only 25 percent of impoundments are lined, and only one-half of landfills are lined... As discussed below, most state programs have generous grandfather clauses for older management units and as a result are unlikely to cover the units that present the most risk. (ALA00036)

Section 3.3.4 cites data from an EPRI survey regaing state environmental controls. The data as presented are misleading because only the results of the surveyed facilities are presented, and no caveat is given as to how many facilities these data represent. For example, page 3-34 states that “85 percent of landfills have groundwater monitoring.” This should state thnt 85 percent of the surveyed facilities have groundwater monitoring, but the surveyed facilities account for less than 25 percent of the population of management units. Given the variability in state programs, these data can hardly be considered representative. This type of misleading presentation is found throughout the Report. (ALA00036)

The Report has little discussion of requirements actually in place at lagoons. Its general inferences about those requirements and the retrofitting of lagoons, based once again on information from EPRI, appear to be completely mistaken. (HEC00056)

Section 3.3.4 (pages 3-28) of the Report presents the impression that CCW surface impoundments around the country are improving because state programs are becoming more effective at regulating this waste, and utilities are voluntarily practicing safer disposal methods. The EPA appears to base much of the belief that improvements are occurring on a survey conducted by the

Electric Power Research Institute (EPRI) of surface impoundments around the country. The survey found that all impoundments in Georgia, Illinois, Indiana, Kentucky, Missouri, and Texas built after 1982 are lined. This statement creates a false picture that the power industry is making steady improvements in its storage of CCW in surface impoundments. However, the large majority of impoundments currently being used were built before 1982. The sites built since 1982 only account for a ten percent increase in the total number of surface impoundments that are lined. While the evidence of the potential problems from surface impoundments has been growing for many years, three fourths of all surface impoundments still remain unlined. (HEC00056)

The Report's conclusions regarding controls are inadequate ... The Agency seems willing to defer to state regulation of co-managed FFC wastes, citing trends in improvements to waste management facilities. In fact, the "trends" we are aware of show that few if any improvements have been made. For example, in 25 years there has been only a 10 percent increase in the use of lined impoundments. Fewer than one percent of the impoundments have leachate collection systems. Furthermore, the Agency admits that it did not conduct state specific analyses to determine whether states are adequately exercising their authority to regulate the disposal of these wastes. (49CAO00058)

The state capacity to regulate coal combustion waste is not what is at issue. The question is, quite simply, whether the wastes are being properly subject to those controls, and the answer is a checkered one, depending on the political will of the state to impose controls. EPA cannot avoid a determination to manage such wastes by identifying the possibility of state-imposed controls (or other federal controls). (NCCLP00282)

The EPA's draft Report declares that the movement from unlined to lined impoundments is concentrated in Georgia, Illinois, Indiana, Kentucky, Missouri, and Texas and that all surface impoundments in these states built after 1982 have liners. Yet in the case of Texas, the Natural Resource Conservation Commission does not require a regulatory permit for any onsite CCW disposal facility. In Georgia and Indiana, no surface impoundments have been built since 1982, and none of the impoundments in these states are lined. Kentucky regulators know of no lined lagoons on their state, and Kentucky law requires no groundwater monitoring at lagoons. In Missouri, two new surface impoundments are lined. However, Missouri law only allows surface impoundments as storage for CCW, and liners are not required. Liners were installed at these two sites by a utility attempting to gain permanent disposal sites. (HEC00332)

The EPA report discusses a move toward better environmental regulation being carried out by the states, yet one of the states generating the largest volumes of UCCW which has experienced substantial damages from UCCW has moved toward no environmental regulation of UCCW. (HEC00332)

In the Electric Power Research Institute (EPRI) survey which is quoted in the Report, only 41 percent of the total sites reporting are lined and three fourths of surface impoundments are unlined. Furthermore, despite their high potential to contaminate groundwater, only 38% of surface impoundments had groundwater monitoring systems as of 1995. This amounts to a rise of less than 10% in the number of impoundments that reportedly monitor groundwater over the number that monitored groundwater twenty years previously according to the EPRI survey (see figure 3-11 in the Report). This reality contrasts starkly with the assertion in the text on page 3-34 of the Report. (HEC00332)

The statements made about the environmental controls at CCW surface impoundments in section 3.3.4 of the Report are very misleading. The Report discusses a trend toward lined landfills, but failed to mention the move toward mine disposal sites that would offset this trend particularly if the move toward deregulation of electricity sales continues in the utility industry. (HEC00332)

## **XX. ADEQUACY OF STATE REGULATIONS**

### **C. Adequacy of Regulations**

Public interest group commenters stated that state regulations provide inadequate control of risks because they do not universally require liners, leachate collection systems, and ground-water monitoring. As evidence of inadequate regulation, some of the commenters pointed to the presence of grandfather clauses for older management units, the imposition of controls on a case-by-case basis, failure to monitor for polycyclic aromatic hydrocarbons and radionuclides, and “blurred lines of authority” within state programs. Also of particular concern was an apparent lack of controls on surface impoundments. One of the commenters also stated that the Report incorrectly assumed that TMDLs under the NPDES program adequately protect aquatic life.

Industry and state government commenters, on the other hand, stated that state regulations are adequate and that additional federal regulation would limit states’ ability to address site-specific concerns. One of these commenters pointed to the frequency of corrective actions and liner requirements as evidence that state regulations are adequate.

Response: The Agency believes that it is appropriate for states to retain some flexibility in addressing site-specific circumstances that may affect the appropriate controls needed for that site, as long as the state is applying certain standards of protectiveness. We believe that national regulations can be developed in such a way to ensure a standard of protection, while providing some flexibility. We see a trend toward significantly improving state programs that we believe can mitigate potential risks over time. However, we identified significant gaps in controls already in place and, in particular, requirements that may be lacking in some states, either in authority to impose the requirements or potentially in exercising that authority. Considering these gaps, along with the potential to present danger to human health and the environment, we are concerned at the possibility that gaps may go unaddressed and that the timeframe for improvement of current practices is likely to be longer in the absence of federal regulations.

The Agency collected samples of coal combustion wastes in support of its effluent limitations guidelines for the steam electric power point source category (Oct. 19, 1982) and analyzed them for organic compounds, including polycyclic aromatic hydrocarbons (PAH), among other types of analytes. These data were also used to formulate this regulatory determination. Basically, EPA found in 1982 that levels of PAH in these wastes were either below detection limits or else were present in only a limited number of samples which indicated that they are not commonly present in these types of wastes. For its conclusions regarding radionuclides, EPA relied on information and scientific studies that were conducted and published by EPA and others prior to issuance of the RTC (discussed on pp. 3-17 and 3-18 of the RTC and in section XIII of this document), which adequately addresses this subject.

## **XX. ADEQUACY OF STATE REGULATIONS**

### **C. Adequacy of Regulations**



### **Verbatim Commenter Statements**

Practices are currently subject to industry best management practices and state regulatory controls that are effective. (IEU00018)

Some Indiana CCP landfill sites have undergone or are currently undergoing corrective actions on either a voluntary or a state agency-directed basis. These corrective actions are required by state landfill regulations whenever a release exceeds background concentrations. In some instances old CCP landfills are being capped or leachate is being collected even though these protective measures were not required when the landfills were constructed. Today, any new construction or major modification of CCP landfill is subject to state regulations that require the utilization of liners. At a minimum, all Indiana CCP landfills are being monitored to ensure that any problems are identified in a timely manner. In Indiana, the groundwater monitoring wells at CCP landfills are placed within 50 feet of the solid waste disposal boundary compared to the 150 meters required by federal Subtitle D regulations. In short, Indiana disposal sites are in full compliance with applicable state and federal regulations including, when appropriate, corrective action requirements. (IEU00018)

We agree with EPA's determination that:

- The electric generation industry has a significant level of installed environmental controls for managing the wastes studied in the Report;
- The majority of states have regulations controlling the management and monitoring of ash management; (PG&E00023)

EPA mentioned numerous state and federal regulations pertaining to electric generating facilities, yet not all of the regulations pertaining to ash management in Massachusetts were described or listed in this section ... Clearly, these activities are closely regulated by appropriate agencies that know and understand the regional issues, geologic setting, and hydrogeology. (PG&E00023)

PG&E Gen's comments document extensive and ongoing regulatory scrutiny of both its facilities, including monitoring requirements. (PG&E00023)

The Department has worked closely with 'the Illinois Environmental Protection Agency in implementing the [Illinois Environmental Protection] Act and in our opinion the steps taken by Illinois to address the disposal and use of CCW and CCB preclude the need for federal regulations in this area. (IDNR00023)

The WRAG would like to affirm the majority of conclusions in the Agency's report and fully supports the Agency's position that continued use of site and region specific approaches by states is more appropriate for addressing the limited health and environmental risks that may be associated with the wastes. It has been WRAG's experience that state, county and municipal agencies are fully cognizant of the use of CCBs and provide appropriate oversight of these

activities. As each county or municipality has land use regulations or ordinances, these local agencies are best equipped to determine the impact non-hazardous waste activities have on their areas. (WRAG00030)

Continued use of site and region specific approaches by states is more appropriate for addressing the limited health and environmental risks that may be associated with the wastes. It has been our experience that the States of Colorado, New Mexico and Texas, county and municipal agencies are fully cognizant of the disposal of these wastes and provide appropriate oversight of these waste activities. As each county or municipality has land use regulations or ordinances, these local agencies are best equipped to determine the impact non-hazardous waste activities have on their areas. Additionally, state solid waste regulations clearly identify the requirements that solid waste uses, including disposal, must meet and additional regulatory oversight from the Agency is unnecessary. (NCE00031)

The trend among electric utilities is to install more environmental controls at waste management facilities, including liners, covers, and groundwater monitoring. (USWAG00037)

Most utility industry co-management occurs in surface impoundments and landfills, with an increasing trend toward dry landfill management of co-managed combustion wastes. EPA identified a clear trend among these units to increased use of environmental controls such as liners, covers, leachate collection systems, and groundwater monitoring. This is the result of several factors: (1) changes in state regulatory requirements; (2) requirements imposed by state permit writers on an ad hoc basis; and (3) voluntary action by individual utility companies as old units are taken out of service and replaced by modern state-of-the-art waste management units. Thus, as of 1995, more than 50% of all landfills and more than 25% of all impoundments at which utility combustion waste co-management occurs were lined, and as older units are closed or removed from service, the trend toward greater environmental controls is likely to accelerate. (USWAG00037)

The states have developed a comprehensive body of regulations applicable to the waste management units in which utilities store and dispose of combustion wastes. (USWAG00037)

There is no point in restating the complex array of state regulations that EPA surveyed in the RTC, but the significance of this information is that both EPA and the states have adopted wide ranging regulatory requirements that apply to these management units under federal and state air, water and solid waste programs. (USWAG00037)

The RTC demonstrated that the states in which OCW management units are located typically have comprehensive regulatory programs applicable to these units. A majority of states have permit programs, as well as authority to impose regulatory requirements pertaining to siting, liners, leachate collection, groundwater monitoring, closure, daily cover, and fugitive dust controls ... The crucial point is that OCW management is actively regulated by the states. (USWAG00037)

The agency concluded, “current management practices and trends and existing state and federal authorities appear adequate for protection of human health and the environment.” APS agrees with the agency that FFC waste disposal is adequately regulated on the state level. (APSC00043)

APS believes the state agencies have the appropriate regulatory structure in place to effectively manage FFC wastes. (APSC00043)

The Agency recognizes the states’ ability to regulate FBC ashes, as well as utility and non-utility ashes, in solid waste management’s units ... States have the ability to develop effective landfill, mine reclamation, and agricultural programs. These programs are developed within each state and can best reflect their unique environmental factors, social and economic needs. It appears that current regulation of these activities is more than adequate. (ISG00048)

Additionally, MCC feels that the materials discussed in the March 1999 Document are properly and duly regulated at the State level. Any attempt to impose Federal restrictions over and above what the States already impose is inappropriate and an ill-advised attempt to implement a “one size fits all” regulatory approach to materials that are as varied as the sources producing them. (MCC00051)

We do not believe there is any need to develop new national regulations or classifications for industrial combustion ash or by-products from the combustion of oil. We believe current regulations and State management programs are sufficient to protect human health and the environment. (CIBO00052)

Existing state and federal regulatory programs insure the proper management of fossil fuel combustion wastes. (CIBO00052)

State regulatory programs are demonstrably more than adequate to address any risks posed by the use and disposal of CCPs. (WVDEPL0003)

Extensive federal and state regulatory programs currently in place adequately protect public health and the environment from risks from the management of these non-hazardous fossil fuel wastes. (PG&E00274)

EPA correctly reported in the Report to Congress that most utility industry co-management occurs in surface impoundments and landfills, with an increasing trend toward dry landfill management of co-managed combustion wastes as well as a clear trend among these units to increased use of environmental controls such as liners, covers, leachate collection systems, and groundwater monitoring. (USWAG00275)

Based on the information presented by EPA in the Report, the existing regulatory controls imposed by the states are inadequate in terms of unit coverage and stringency, they widely variable across

the states and are primarily based on permitting policies and not enforceable regulations. The following examples illustrate these points:

- Most environmental control requirements are imposed by states on a case-by-case basis. On page 3-29, the Report states that “therefore if the trend in liner usage is driven by regulatory agencies in these states, it appears to result from a change in permitting policies rather than written regulations.” The EPA should not consider permitting policies to be “adequate regulatory control” and does not to so under any other federal environmental program unless the permitting process (and individual permits) have been approved (e.g., air programs).
- Most management units surveyed operate under an environmental permit. However, “information on the degree of protection afforded by these permits was not collected in the EPRI survey.” The EPA should not be relying on industry surveys of state regulatory agencies and should collect information independently to determine the stringency of such permit programs and the extent of their coverage.(ALA00036)

In terms of what the states actually do or do not require, the Report reveals the following:

- Most states do not impose specific requirements for groundwater monitoring of impoundments.
- More than twice as many landfills surveyed were subject to groundwater performance standards compared to impoundments. However, despite of being “subject” to these standards, almost 10 percent of the landfills and fully one-half of the impoundments are not required to monitor the groundwater. The EPA correctly notes that “therefore it is unlikely that exceedences would be detected at these facilities.”
- Based on examination of permitting programs at five states, the EPA concludes that use of leachate collection systems, groundwater monitoring, and regulatory permits has a “high rate of implementation at landfills,” and “significant implementation” at impoundments. This appears to be a generous appraisal of these programs. A close examination of these five state programs (see pg 3-60 and the ASTSWMO survey) reveals that while all five appear to require operating permits, only two of five require leachate collection and/or groundwater monitoring at impoundments and only three of five require these controls at landfills. This is neither a “high rate of implementation” nor a “significant rate of implementation.”
- In addition, the five state programs examined by EPA each have generous grandfather clauses that typically exempt older existing units. This is likely to also be true of other state programs. This aspect of the state programs needs to be investigated by EPA.

- The ASTSWMO survey of state programs asked the two following questions: Do the states require generators to submit regular reports addressing the quantities of waste generated: and Do the states require regular reports addressing the location of the storage, treatment, and disposal (i.e., management) facilities? Forty-three states answered both of these questions “no” and seven answered “yes.” Therefore, it appears that state programs know little or nothing about how much waste is being generated or where it ends up.
- The ASTSWMO survey further states that with respect to impoundments, there are “blurred lines of authority” within state programs. The state approaches are a mixture of widely varying water quality and waste regulatory programs. This piecemeal approach, which is apparent between and even within state agencies, is not an appropriate substitute for federal requirements.
- As a last example of state environmental controls to which the EPA seems willing to defer, the following from page 3- 14 of the Groundwater Risk Assessment is offered: “Of the 16 unlined surface impoundments (surveyed by EPRI), 12 are located in Florida and are percolation basins designed to discharge to groundwater. This practice of discharging to groundwater is allowed under state wastewater permits.” (ALA00036)

The Report indicates that states have exercised their authority to impose stricter controls at landfills more than at surface impoundments. While this may be good news, there is evidence from materials in the docket (US Department of Energy, 1993) that suggests that surface impoundments continue to be the dominant utility choice for on-site management of coal combustion wastes. According to this source, “the large number of impoundments relative to landfills in certain regions may reflect State regulatory issues (i.e. more flexible design and operating standards for surface impoundments). Many utilities have chosen to extend the life of the impoundments by building up the side walls. of the ponds above the ground - this strategy has been employed instead of more costly alternative management methods, including (1) converting the existing wet handling system to direct waste to a different site; (2) acquiring land to construct new units (3) converting to a new dry handling dry handling system and (4) transporting coal combustion waste to off-site waste management units.” (ALA00036)

Even though impoundment expansions require state review, the Report indicates that standards for impoundments are not as protective of health and the environment as new units, and in particular dry handling units. Thus, without more evidence to prove otherwise, we are not convinced that state regulations are being effective in applying stricter standards. (ALA00036)

State regulatory efforts are extremely weak. (HEC00056)

The Report highlighted Indiana’s efforts as one of the best examples of state programs improving its regulation of electric utility impoundments. Yet we have found no evidence of enhanced protection in place at any of these sites. We can locate no evidence of constructed liners or ground

water monitoring at any of the surface impoundments. The only parameters covered by the NPDES permits that had regulated limits were total suspended solids (TSS), oil and grease, and pH. Copper and iron are only regulated when the plant's turbines are cleaned. Boron, which an Indiana inspector stated should be expected to be a problem almost anywhere you store coal ash, is not regulated at any of these sites. (HEC00056)

At some sites other parameters are monitored. These include arsenic, lead, cadmium, chromium, and zinc. However, there are no enforceable limits on any of these contaminants so contamination can exceed drinking water standards by several times with no action being taken. Furthermore the permits only require monitoring to be done for these parameters for six to twelve months from the beginning of the permit. Provisions are made in the permit to set limits on these parameters if "significant quantities" of these contaminants are found. But there is no clarification of what "significant quantities" means, and IDEM's permit writers within the Office of Water Management are currently under strict orders not to modify any existing permits. For the past few years, due to a backlog in new permits, they have only been focusing on issuing new permits. Therefore, no real effort by the agency is being made to control the levels of these contaminants being released into the environment. (HEC00056)

The information we have gathered in just a short time shows little if any real protection being practiced at these sites. (HEC00056)

The prior EPA Report concluded preliminarily that coal combustion waste need not be regulated under RCRA Subpart C as hazardous, but rather that the wastes should continue to be regulated under Subpart D as solid wastes. This conclusion rested on the assumption that mitigative measures under Subpart D such as installation of liners, leachate collection systems, and ground-water monitoring systems and corrective action to clean up ground-water contamination, would be adequate for protecting public health and the environment. The EPA recommendation was predicated on the application of such measures to the management of coal combustion wastes. *Id.* at ES 4-5. Unfortunately, such measures are not being employed universally among the states. (NCCLP00282)

The information provided by the Hoosier Environmental Council in current and past comments, demonstrates the wide variability among states in the caliber of the management programs for coal combustion wastes. (NCCLP00282)

State programs that regulate disposal of coal combustion wastes, CCW, and other fossil fuel wastes are grossly insufficient, particularly with respect to surface impoundments. (HEC00332)

Environmental controls enforced by the states at CCW disposal sites are grossly insufficient. In our comments for the first public comment period, we discussed our findings of a review of requirements at surface impoundments in Indiana. HEC found that the only permit required for an Indiana surface impoundment, the Nation Pollution Discharge Elimination System or NPDES

permit, makes no distinction of whether an impoundment has liners or groundwater monitoring and that, according to the relevant state inspectors, none of the CCW surface impoundments in Indiana have liners or groundwater monitoring. Furthermore, only a token effort was made to monitor the surface water discharge at these sites for the metals most commonly found in CCW leachate. (HEC00332)

Overall, only Illinois appears to have made any progress towards lined surface impoundments. Of the ten states surveyed, only Illinois, South Carolina, and Alabama have established groundwater monitoring at most of their impoundments. Not surprisingly, all nine new contamination cases that we are turning in from these states in these comments are occurring at surface impoundments. This would indicate that at many surface impoundments that do not have groundwater monitoring, groundwater contamination may be occurring undetected. (HEC00332)

In the Executive Summary EPA declares that states currently have more authority to impose controls at CCW disposal sites, and these controls can potentially mitigate any risk of contamination posed by CCW. However, HEC found that most state laws and regulations do not require liners or groundwater monitoring for new impoundments. Furthermore with or without laws, our survey has found few states are willing to impose these controls ... Indeed our survey found that in most states, little if any effort is being made simply to keep track of the controls being imposed at CCW surface impoundments. (HEC00332)

As we have already pointed out, most large scale CCW disposal sites have no ground water monitoring. And many of those that do have monitoring provisions are only analyzing for a few parameters in ground waters affected by CCW ... Whole classes of harmful compounds that should be monitored for around CCW disposal sites are not being monitored for. For example poly-aromatic hydrocarbons (PAHs) are a highly carcinogenic family of chemicals commonly found in coal, coal tar and coal combustion products, yet these substances are seldom if ever analyzed for in ash characterization schemes mandated by state regulatory agencies and never included in ground water monitoring schemes for CCW disposal sites ... The situation with radionuclides is similar to that for PAHs in that they are known to be present in coal combustion wastes, yet ground water monitoring for radionuclides at CCW disposal sites rarely occurs. (HEC00332)

The Report to Congress assumed that the National Pollutant Discharge Elimination System (NPDES) and the setting of the Total Maximum Daily Loads (TMDLs) adequately protected aquatic life in receiving waters. However, this research shows that that is not the case. It shows that ecological damage from surface impoundments has the potential of being a much larger problem. (ALA00292)

**XX. ADEQUACY OF STATE REGULATIONS**  
**D. Effects of Deregulation**

One public interest group commenter argued that EPA did not address the effects of deregulation of energy sales in its consideration of state regulations. The commenter believed that, without federal standards to create a level playing field, states may face great pressure to relax their disposal requirements to give their utilities a competitive advantage.

Response: At this time the Agency is unable to anticipate the possible impacts of deregulation on current state regulatory programs for managing fossil fuel combustion waste. We believe that it would be arbitrary and unfair to project theoretical changes in state programs.



## **XX. ADEQUACY OF STATE REGULATIONS**

### **D. Effects of Deregulation**

#### **Verbatim Commenter Statements**

The effects of the deregulation of electricity sales and its potential to promote unacceptable disposal standards among the states are not recognized or addressed. The Report fails to take into account the effect that an open competitive market in electricity sales may have on disparities in environmental regulation of power plant wastes. If deregulation of electric utilities occurs, utilities in states with responsible disposal standards may face a competitive disadvantage with utilities in states such as Indiana that allow open dumping of power plant wastes into drinking water supplies. Without federal standards to create a level playing field, state may face great pressure to relax their disposal requirements for power plant wastes in order to give their utilities a competitive advantage in selling electricity on the open market. Therefore EPA should consider the effects of deregulation on state programs before making its Final Determination. (HEC00056)

## **XXI. COSTS AND ECONOMIC IMPACTS**

Commenters from both industry and public interest groups expressed general concerns about EPA's methodology for computing compliance costs and industry economic impacts. These ranged from comments on basic methodology to quite specific comments on assumptions regarding incremental costing, Subtitle D vs Subtitle C cost factors, impacts on drinking water and industry impacts.

Response: EPA believes its analysis and consideration of costs and economic impacts were sufficiently detailed and adequate to support its determination. Partial equilibrium modeling was not done because of the pace of change in this industry. Consideration of cost and economic impacts beyond the typical facility-level costs and industry-wide impacts presented in the Report to Congress was not warranted. For this computation only the costs associated with Subtitle D type liners was considered.. Impacts on drinking water costs and of other regulatory variants will be considered as this regulatory determination warrants. Other specific concerns raised by the commenters with regard to the cost and economic analysis are addressed in the responses below. EPA acknowledges that comments were submitted on the basis of the March 1999 RTC. The cost and economic impact analyses will be revised or supplemented as warranted during the development of proposed regulations.

## **XXI. COSTS AND ECONOMIC IMPACTS**

### **Verbatim Commenter Statements**

EPA's general methodology for estimating cost impacts of Subtitle D requirements at FFC waste facilities is comparable with other special waste studies conducted in the past by EPA, other government agencies, and trade associations. However, documentation and a detailed explanation of incremental costs to the industry for managing FFC waste are not adequate to allow for a thorough evaluation of the underlying assumptions. Accordingly, it is not possible to evaluate EPA's estimated incremental compliance costs. The data that are provided, however, indicate discrepancies with previous special waste studies that have estimated the incremental unit costs for FBC waste disposal. (DOE00020)

PG&E Gen disagrees with EPA's cost analysis. (PG&E00023)

I have grave concerns that EPA's Report to Congress limits discussion of cost to the economic cost only for management of coal combustion products at a disposal site under RCRA D-like requirements ... Even in treatment of the economic cost of coal combustion product cost to the utility industry, the agency has severely under-estimated the impact on the economic viability of the industry. (NMA00024A)

EPA's economic analysis grossly underestimates the impact of Subtitle C regulation. In short, EPA has failed to prepare a satisfactory economic analysis that would justify additional regulatory burdens. As we discuss below, the true economic impacts of the regulatory measures suggested would be greater by orders of magnitude. (USWAG00275)

The Report dismisses the regulation of fossil fuel wastes under Subtitle C, without any estimates of the costs of implementing the specific requirements of this large Subtitle ... There are also no estimates of the costs of beneficial uses of these wastes in the Report ... In Chapter 3, the Report claims that coal usage would likely decrease if utility coal combustion waste (UCCW) were regulated under Subtitle C of RCRA. There is no attempt to quantify this decrease in the Report ... Why is conservation not considered a benefit? This basic "impact" is not discussed in this Report. (HEC00056)

A fundamental incentive in the implementation of effective programs to prevent drinking water contamination that was not evaluated in the Report to Congress is the costs associated with contamination of a drinking water supply. Drinking water contamination is considered a real, economic threat to states and individual communities. (ALA00292)

I believe that it is well past time for all non-renewable energy sources to start "paying their own way," so that an honest competition with renewable energy resources can be obtained in a free marketplace. (CITZ00267)

The costs of implementing these standards would cause many older coal-fired plants to be shut down, and create incentives for switching to cleaner forms of energy. If national standards are not imposed, the coal industry will continue to receive a subsidy in the form of cheap disposal costs that will keep coal cheaper than alternative forms of energy. (SIERRA00278)

EPA should use this issue of CCW to bring to the attention of Congress the need for alternative energy forms. (SOCM00279)

National regulations on the disposal of CCW such as requirements for liners, groundwater monitoring, and leachate collection systems would be a serious blow to the reign of King Coal. The EPA report says the costs of implementing these standards under the federal hazardous waste laws would cause many older coal-fired plants to be shut down and create an incentive for newer plants to switch to cleaner forms of energy. If national standards are not imposed, the coal industry will continue to be subsidized -- cheap waste disposal costs will keep coal cheaper than alternative forms of energy. (CITZ00284)

## **XXI. COSTS AND ECONOMIC IMPACTS**

### **A. Consideration of Site-Specific Factors**

One federal agency commenter expressed concern that EPA had not considered the numerous site-specific variables that affect disposal unit design and operation in its cost and economic analysis.

Response: The primary objective of the cost and economic analysis was to assess and present representative or typical impacts on affected facilities and industries. This approach was taken in a context of resource constraints, data limitations, and the desire to make the results indicative of the general magnitude of impacts. It is true that each site may have a unique set of variables which can affect disposal unit design and operation. Our analysis was intended to present what the magnitude of impacts on facilities and the industry should be “on average” based on reasonable and representative assumptions. EPA acknowledges that there might be significant variation from plant to plant which could not be addressed given the resource constraints placed on the analysis and the unique site-specific variables which occur at fossil fuel burning facilities.

**XXI. COSTS AND ECONOMIC IMPACTS**  
**A. Consideration of Site-Specific Factors**  
**Verbatim Commenter Statements**

EPA does not appear to have considered the numerous site-specific variables that affect disposal unit design and operation in its analyses. Site-specific differences can dramatically affect compliance costs, as documented in several previous EPA special waste studies. (DOE00020)

## **XXI. COSTS AND ECONOMIC IMPACTS**

### **B. Underestimate of Compliance Costs**

Industry and federal agency commenters expressed concern that EPA had underestimated compliance costs because the Agency overestimated the operating life of equipment. It was suggested that a more appropriate amortization period would be 15 or 20 years. One of the commenters suggested that EPA's discount rate of 7 percent was too low, given impending deregulation of the industry. Another of the commenters questioned why EPA's baseline costs differed from those estimated by industry. An industry commenter stated that EPA did not adequately consider compliance assurance fees and financial assurance requirements, which range from \$15,000 to \$30,000 per year for its facilities.

**Response:** As noted by a DOE commenter, a 1993 DOE Study<sup>3</sup> assumed a 15 year equipment lifetime. However, that same study noted that as a result of life extension practices, the average life expectancy for a disposal unit was between 20 and 30 years. In 1997, EPRI and USWAG conducted the Coal Combustion By-Products and Low-Volume Wastes Comanagement Survey.<sup>4</sup> The survey indicated that the ages of active disposal units range from newly opened to more than 40 years old. In 1997, the median age of active surface impoundments was 22 years with a median anticipated closure date in 16 years, for a total lifetime expectancy of 38 years. The median age of active landfills was 15 years with a median anticipated closure date in 12 years, adding to a total lifetime expectancy of 27 years. It is apparent that the average life expectancy of disposal units is increasing. Therefore, EPA believes the 40-year life expectancy assumed in the cost analysis was a reasonable assumption for newly constructed waste management units. Furthermore, the 40-year assumption was agreed upon between EPA and representatives from industry.

With regard to the comment about amortization, the Office of Management and Budget provides specific guidelines on discount rates to be used in evaluating federal programs whose benefits and costs are distributed over time. This applies to regulatory impact analyses and all agencies of the executive branch of the federal Government. To remain consistent with OMB recommendations and other analyses conducted by the EPA, a real discount rate of 7 percent was used. However, EPA acknowledges that this rate may not reflect the realities of corporate finance.

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<sup>3</sup> FF2P-S0248. Coal Combustion Waste Management Study. Draft Report. ICF Resources, Inc. February 1, 1993.

<sup>4</sup> FF2P-S0199. Coal Combustion By-products and Low-volume Wastes Comanagement Survey. EPRI. December 1, 1997.

The DOE commenter also noted that discrepancies appear to be the result of different baseline costs in the CIBO report<sup>5</sup> and EPA's Report to Congress. EPA's baseline unit cost is based on the construction of an unlined FBC ash landfill. CIBO's baseline cost is taken from EPA's work on regulation of cement kiln dust (CKD). The CKD baseline analysis assumed the construction of a landfill within a pre-existing excavated mine located on the property. Therefore, excavation costs are not included in the CIBO baseline costs. Excavation costs are included in the EPA baseline cost for constructing onsite landfills at FBC facilities. In addition, a 20-year operating life for the landfill was assumed for the cement manufacturing industry compared to a 40-year operating life for the utility industry. These two differences likely account for most of the disparity between the two baseline unit cost estimates.

With regard to the comment about consideration of compliance assurance and financial assurance costs, EPA did consider financial assurance fees in its estimate. These costs were included in indirect cost estimates which are determined as a percentage of direct capital and O&M costs.

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<sup>5</sup> FF2P-S0071. Report to the U.S. Environmental Protection Agency on Fossil Fuel Combustion Byproducts from Fluidized Bed Boilers. CIBO Special Project on Non-Utility Fossil Fuel Ash Classification and ICF Kaiser Consulting Group. November 1, 1997.



**XXI. COSTS AND ECONOMIC IMPACTS**  
**B. Underestimate of Compliance Costs**  
**Verbatim Commenter Statements**

EPA appears to have overestimated the operating life of equipment in its analysis of compliance cost. This, in turn, may have resulted in significant underestimation of total compliance costs. EPA's analysis of incremental compliance cost assumed a 40-year operating life for management units. A 1993 DOE analysis based on EPRI and utility company data indicated that 15 years was generally the lifetime used for designing and engineering disposal sites (Coal Combustion Waste Management Survey, Report Prepared for U.S. Department of Energy, Office of Fossil Energy, February 1993). In addition, current life extension practices have increased the average life expectancy of a disposal unit to between 20 and 30 years (average 25 years). Hence, based on both on a previous DOE study and current life extension practices, a 40-year equipment operating life is a high-end life-expectancy value and results in lower compliance cost estimates than a 15-25 year life expectancy. Because details of the cost components of the management unit scenarios were lacking both in the RTC and the Technical Background Document, it was not possible for DOE to estimate the anticipated increase in the compliance costs under a 15-25 year life expectancy scenario. (DOE00020)

EPA's analysis indicates that post-regulatory control costs for FBC waste generating facilities amount to \$32 million per year (see *Technical Background Document For the Report to Congress On Remaining Wastes from Fossil Fuel Combustion: Cost and Economic Impact Analysis*, March 30, 1999), which is comparable with the Council of Industrial Boiler Operators' (CIBO) Subtitle D compliance cost estimate of \$28 million per year (See Docket Reference: FF2P-S0371). Based on EPA'S RTC background technical document (See Docket Reference: FF2P-S0371), the compliance cost for managing FBC waste under a Subtitle D scenario is \$30.1 per ton, approximately 2 times the baseline cost of \$14.7 per ton (i.e., the incremental compliance cost is slightly over 100 percent of the current material disposal cost). Based on CIBO's analysis, incremental costs, on a unit cost basis, would range between \$15 and \$42/ton, with a weighted average value of \$18/ton, more than 4 times the current material cost of \$4/ton. These discrepancies appear to be the result of different baseline costs in the CIBO and EPA RTC, despite the fact that EPA's analysis of FBC wastes was based on the same facilities addressed in the CIBO Report. Without access to the actual landfill costs estimated for both the baseline and compliance scenarios, it is difficult to address the cause(s) of these discrepancies. (DOE00020)

In the case of our facility, which has been operating the oil fired unit for over 25-years, the 40-year amortization time period may be unrealistic. A 20-year additional operating life span for this unit would be more realistic. (PG&E00023)

In Table 3-27, EPA did not include all annual Operation and Maintenance costs, at least in some states: In Massachusetts, PG&E Gen facilities have annual compliance assurance fees required for

solid waste landfills and financial assurance requirements. The costs for these items can range from additional \$15,000 to \$30,000/yr depending on the size of the facility and the type and cost of financial assurance. (PG&E00023)

PG&E Gen disagrees with EPA's cost analysis ...The facility estimates it would incur a single year incremental compliance cost of approximately \$ 3.0 million dollars if EPA were to require the facility to immediately line its' unlined SSB with a HDPE liner as indicated in section 6.7.2 of the report. (PG&E00023)

EPA utilized a 40 year amortization at 7% real interest to convert capital expenses to annual costs. The idea that newly formed deregulated companies will be able to raise money for building facilities that have no ability to generate revenue and do so at rates below prime would seem suspect by comparison to similar types of publicly traded market entities ... Even if 7% capital for building of ash management facilities can be guaranteed, the amortization time is 40 years. The economic life of a coal plant is commonly considered to be in the 50 to 60 year range ... many of the plants to be impacted are around 30 years of age or more now. The idea that an asset (ash management facility) will be amortized for a time period longer than its useful life has significant problems in the world of finance. (NMA00024A)

## **XXI. COSTS AND ECONOMIC IMPACTS**

### **C. Underestimate of Economic Impacts**

Federal agency and industry commenters stated that EPA underestimated the economic impact of regulation of FFC waste. Some of these commenters specifically suggested EPA should have gauged its estimate of impacts against coal-fired utility sales, rather than total electric power generating industry sales. Other commenters stated that, given deregulation of the industry, EPA should have gauged impacts against the generation sector only (not the transmission and distribution sectors). One commenter stated that correction for all factors (to account for the generation sector only, coal-fired sales only, and projected future sales) would increase the estimated cost of compliance to 2.2 percent of the value of industry shipments for coal-fired utilities and require an increase in the price of wholesale power by 30 percent. As a result, many plants would be placed “on the margin” and subject to closure, creating concerns for future electric reliability.

Response: While most of the impacts will be physically located at coal-fired facilities, we believe the economic and financial impacts will be absorbed and recovered by an operating utility, which may operate a mix of coal, oil, combined cycle, natural gas, nuclear and hydroelectric generating facilities. These various generating units are merged by the utility company in setting prices. For example, most of the affected coal-fired capacity is controlled by large integrated investor-owned utilities which operate a diversified assortment of generating units. Impacts at the plant level, as indicated by a model plant analysis, are based on DOE-reported average prices and utility level financial ratios. These are representative of what should be the impact at a generating facility based on a plant owner’s typical financial parameters.

In addition, coal is the predominant fuel used to generate electricity in this country. The transmission and distribution sectors cannot exist without the coal-fired generator sector of the utility industry under either regulated or deregulated markets. These costs will be shared through contract agreements among the three sectors under both market conditions. Still, EPA acknowledges that operating units of utilities will undoubtedly be impacted differentially, as the commenter claims.

At the macro level, the economic impact analysis presumes impacts and price effects will be passed on to consumers. This is a simplified and worst case assumption and avoids complex and uncertain distributional analysis of intermediate price effects through wholesale markets at regional, state, and local levels. The Agency does concur that wholesale electricity price impacts could vary substantially from area to area. Pending determination of a specific regulatory approach, EPA believes its estimates of incremental compliance cost to be under 1% of sales as stated in the RTC.

One commenter projects \$20 billion decrease in coal-fired utility sales. It is unclear if this decrease is projected based on a decrease in electricity use by consumers, a decrease in demand because substitute fuel sources are cheaper, or a decrease in demand because of deregulation of

the industry. Demand for electricity has gone up every year from 1949 through 1998, and coal consumption for electricity has gone up every year from 1949 through 1998, except in 1986 and 1991.<sup>6</sup> Also, the commenter does not appear to take into consideration that the price of coal is expected to decline from \$19 per ton in 1995 to \$15 per ton in 2010 while natural gas, for the same period, is projected to increase from \$1.55 per 1000 cubic feet to \$2.48 per 1000 cubic feet.<sup>7</sup> In addition, if there is a decrease in demand for coal-fired power, the cost of compliance with the regulation will decrease because waste generation quantities will decline resulting in an extension of the useful life of the ash landfills and ash impoundments. With the decrease in the price of coal and decrease in waste generation quantities, it appears that operating and compliance costs will be declining along with any projected decrease in sales. Also, the price for substitute goods (natural gas electrical generation) is increasing which favors an increase in demand for coal electrical generation.

EPA reiterates that the above comments were prepared on the basis of the Agency position set forth in the RTC; analyses will be revisited as the regulatory determination warrants. EPA also acknowledges that many of these cost and economic issues are quite conceptual in nature and will bear revisiting as noted if a final regulatory determination warrants.

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<sup>6</sup> DOE Annual Energy Review.

<sup>7</sup> DOE/EIA Annual Energy Outlook.

**XXI. COSTS AND ECONOMIC IMPACTS**  
**C. Underestimate of Economic Impacts**  
**Verbatim Commenter Statements**

EPA has underestimated the industry impacts for comanaged waste at coal-fired utilities under a Subtitle D regulatory scenario. EPA estimated the industry impacts for imposing Subtitle D requirements at co-managed waste from coal-fired utilities at 0.4 percent of the industry's electricity sales. EPA used an estimate of \$212 billion per year to represent electric power generating industry sales. However, the coal-fired utility component represents only about 56 percent of all electricity generated in the United States (See page 3-69, Report to Congress, Volume 2). Consequently, it appears that EPA should have used the coal-fired generating capacity to estimate the industry impacts as a percentage of sales. Based on the 1999 EIA Annual Energy Outlook, the sales from coal-burning generators in 1997 were approximately \$123.9 billion. This means that the estimate of industry impacts related to comanaged waste from coal-fired utilities should be increased to approximately 0.7 percent of the industry's sales (assuming that all other components of the cost analysis remain unchanged) .(DOE00020)

The restructuring of the utility industry and the resultant competition in the electric industry are fully underway in Pennsylvania. The average wholesale value of electric power hovers in the \$0.02-\$0.03 per kWh range, not the \$0.07 assumed by EPA. (PG&E00023)

EPA indicated that they did not wish to consider the impact under deregulation since many of the details of the deregulated electric power industry are not known. In fact at least one detail of the deregulated market lace is known with certainty. Electric generation, transmission, and distribution costs will be "unbundled". In other words, electric generation will stand on its own economically ... Based on discussions with power companies and electric coops in particular, and utilizing USDOE estimates of transmission system costs, the 7 cents breaks down approximately as 3.1 cents/KWH to generation, 1.5 cents/KWH to generators transmission to interconnect points, 2.5 cents/KWH to transmission and distribution systems. (NMA00024A)

According to Dr. Paul's analysis, the actual impact to generating sector revenues could be a loss of up to 54.5%; in the case of rural cooperatives, lost revenue from these regulations could reach 64%. Furthermore, those estimates are based on an assumption that EPA's cost estimates are reasonably accurate. In fact, however, Dr. Paul has identified other potential cost impacts that could raise the impact on a rural cooperative's earnings to as high as 76%. (NMA00024)

The lack of clarity in documentation affected the economic analysis and resulted in inconsistent treatment of utilities relative to other power producers and inconsistent treatment of the utility power sector relative to other industries. (USWAG00275)

EPA's documentation mentions only in passing the critical and highly significant changes that have taken place over the past three years in the structure of the wholesale and retail electricity markets. Indeed, significant restructuring has already occurred with observable and significant shifts in ownership of generation, the creation of robust wholesale power markets, and the creation of power exchanges and similar institutions to facilitate commerce. These changes have placed significant competitive pressures on the price of power and, therefore, on the operating costs of generators, whether utility or non-utility owned. For example, in Texas, which consumes more coal for electrical power generation than any other state, utility industry restructuring has frozen the price of electricity, and any increased cost imposed by the Bevill determination must be borne by the generation companies. However, there is no indication that these changes have been factored into EPA's analysis. For example, the Economic Background Document devotes two paragraphs to acknowledging that restructuring is taking place, but there is no subsequent attempt to translate those changes into a realistic representation of the power sector that would lead to a credible analysis of the economic impacts of these changes. Economic Background Document at 6-3. EPA simply wrote off econometric modeling due to "uncertainty surrounding this restructuring." 2 RTC at 3-68. Without taking the fundamental structure of the industry into account, EPA cannot present a plausible economic analysis. (USWAG00275)

EPA's documentation does contain data that could have been used to present a somewhat better characterization of the industry and the economic impacts of regulation. For example, the prices of delivered power quoted for 1996 are not relevant to the impact on generators of compliance costs because of the unbundling of generation from transmission and distribution operations, which remain regulated entities. Compliance costs associated with waste management related to generation now fall entirely on the separate generation units, which will be unable to recover those costs because the markets they serve are now deregulated. (USWAG00275)

Coal-fired utility-owned generation accounts for about 50% of the power produced nationally.... These quick corrections to EPA's calculations demonstrate the need for a more careful analysis of the cost impacts on coal-fired generation. (USWAG00275)

These plants are generally price takers. Assuming, arguendo, that the proportion of the value of 1996 sales related to generation is 60 percent, and that coal-fired plants are responsible for 50% of that value, we can calculate a sales figure of approximately \$60 billion, compared to the \$212 billion figure EPA used. Therefore, the approximate \$1 billion annualized cost of compliance for coal-fired plants would represent 1.7 percent, rather than 0.4 percent of the "value of industry shipments," a four fold increase in economic impact. Furthermore, EEI expects the sales figure to be lower by as much as \$20 billion by 2000. (USWAG00275)

These quick corrections to EPA's calculations demonstrate the need for a more careful analysis of the cost impacts on coal-fired generation. Many plants would be potentially affected and placed "on the margin" and subject to closure if EPA imposed the controls discussed in the Report to Congress. Indeed, this effect could occur quicker than the rate at which new substitute, alternative

fuel plants could be constructed. Thus, we have significant concerns about the effects EPA's regulatory determination could have on electric reliability. (USWAG00275)

An alternative approach to assessing the economic impact on the power markets would be to examine the effect of imposition of costs of increased regulatory controls on the wholesale price of power (i.e., the commodity price) ... The competitively determined wholesale price of power nationwide averages about 2.5 cents/kWh (not the 7.1 cents/kWh assumed in Table 2-5, which represents the delivered, fully-bundled price of power) ... Therefore, the compliance cost estimate of 0.8 cents/kWh would suggest the price of wholesale power would need to increase by approximately 30 percent for coal-fired plants to remain competitive. (USWAG00275)

## **XXI. COSTS AND ECONOMIC IMPACTS**

### **D. Inadequate Consideration of Costs and Benefits**

One public interest group commenter stated that EPA should have estimated the costs of Subtitle C regulations and estimated the costs of beneficial uses. The commenter also was concerned with the failure to quantify the decrease in coal usage if CCW were regulated. Another public interest group commenter argued that the Agency should have considered the economic impact of the threat to drinking water supplies posed by FFC waste management.

An industry commenter stated that EPA should have considered the cost of materials handling and haulage to offsite disposal that would be associated with a ban on minefilling. The commenter also stated that EPA should consider the environmental justice impact that would result from regulation of FFC wastes, which the commenter purported would preferentially devastate the Electric Cooperatives that supplying barely subsisting farmers across much of rural America.

Response: The Agency's cost and economic analysis considered a risk mitigation alternative that assumed generators would construct composite-lined landfills and impoundments. This alternative was chosen for costing (as opposed to full Subtitle C regulation) because it was identified as an alternative that would be practical and effective to target and mitigate the potential risks identified in EPA's risk assessment. EPA acknowledges the possibility of reductions in coal use and of drinking water resource impacts, depending on the ultimate regulatory option, if any, selected. These will be investigated as work proceeds if warranted.

At the time the cost analysis was conducted, EPA had not identified any potential minefilling procedures or regulations. This is still the case. Pending further work, EPA is uncertain as to what type of regulation might be warranted for minefilling. Therefore, no cost and economic analysis was conducted for these uses. However, EPA notes that minefilling is a clear function of proximity to available fill sites as a cost avoidance mechanism, given the high cost of transport. The cost elasticity of demand for minefilling will reflect this, as well, of course, as well as the cross elasticities of alternatives. Elasticities are entirely dependent on clearly defined alternative products.

Economic effects of potential FFC waste environmental regulation on electric cooperatives and their customers will be further examined if regulatory options warrant. Electric cooperatives serve some 32 million people in 46 states. Their customers, while rural in characteristic, include a great number of non-farmers including businesses, schools, county and small city governments, churches, and nonfarming rural residents. Also, many farmers now obtain electricity from non-cooperatives. In addition, 875 electric cooperatives distribute electricity as compared to only 60 electric cooperatives that generate and distribute electricity.<sup>8</sup> Thus, the distributional effects to

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<sup>8</sup> National Rural Electric Cooperative Association.



farmers would be extremely difficult to determine. Moreover, farmers, as well as electric cooperatives, are experiencing rapidly changing markets which, compared to fossil fuel waste management requirements, will have much greater effects on their ability to remain competitive and profitable. EPA acknowledges impact on electric cooperatives to be an important factor.

**XXI. COSTS AND ECONOMIC IMPACTS**  
**D. Inadequate Consideration of Costs and Benefits**  
**Verbatim Commenter Statements**

EPA is considering a ban on minefill applications. The costs of materials handling and haulage to offsite disposal or utilization facilities can be a significant cost and the size of that cost is impacted by where the ash is hauled to. Many FBC units and rural electric cooperatives in the Midwest haul ash back to the minesites from which they buy their coal (or to site only a few miles away). This means that the ash can be moved on a “back-haul” which costs only about 1/3rd of the cost of a “front-haul” to another equidistant site. Since a ban on minefill applications would imply a RCRA subtitle D style landfill as an alternate destination the additional transportation cost becomes an incremental cost. (NMA00024A)

In their Report to Congress, EPA expressed concerns about environmental justice if subsistence farmers near ash management sites were preferentially affected by various receptor paths ... It is interesting that the economic analysis done by EPA lays the groundwork to realize that the proposed regulations will preferentially devastate the Electric Cooperatives that are supplying today’s barely subsisting farmers across rural America and yet there is no mention of fundamental fairness in this respect. (NMA00024A)

The Report dismisses the regulation of fossil fuel wastes under Subtitle C, without any estimates of the costs of implementing the specific requirements of this large Subtitle. These estimates could vary substantially based on different scenarios of Subtitle C that could be invoked. For example, the cost for regulating fossil fuel wastes as a listed hazardous waste versus the cost for regulating these wastes as hazardous based on the characteristics of specific waste streams to be disposed could differ substantially. There is no discussion of such scenarios or estimates of their costs in this Report. There are also no estimates of the costs of beneficial uses of these wastes in the Report. (HEC00056)

In Chapter 3, the Report claims that coal usage would likely decrease if utility coal combustion waste (UCCW) were regulated under Subtitle C of RCRA. There is no attempt to quantify this decrease in the Report. Furthermore, Section 3.8, FINDINGS AND RECOMMENDATIONS of Chapter 3 declares this decrease unacceptable without explanation. What about the major environmental benefits to be gained from this decrease? Would not an increase in disposal costs encourage the conservation of our coal resources? Why is conservation not considered a benefit? This basic “impact” is not discussed in this Report. (HEC00056)

A fundamental incentive in the implementation of effective programs to prevent drinking water contamination that was not evaluated in the Report to Congress is the costs associated with contamination of a drinking water supply. Drinking water contamination is considered a real, economic threat to states and individual communities. (ALA00292)



## **XXI. COSTS AND ECONOMIC IMPACTS**

### **E. Regulation as an Incentive for Alternative Energy Sources**

A few citizen and public interest group commenters suggested that EPA should consider regulating FFC waste management in order to increase the cost of reliance on non-renewable energy sources and make renewable energy sources more competitive in the marketplace.

Response: Analysis of the impact of any potential regulation of FFC waste on the competitiveness of renewable energy sources was beyond the scope of the economic analysis conducted for the RTC. Furthermore, while promotion of alternative energy sources may be a desirable goal, it is not a primary consideration under RCRA, nor is it one of the Bevill study factors EPA is required to consider.

**XXI. COSTS AND ECONOMIC IMPACTS**  
**E. Regulation as an Incentive for Alternative Energy Sources**  
**Verbatim Commenter Statements**

I believe that it is well past time for all non-renewable energy sources to start “paying their own way,” so that an honest competition with renewable energy resources can be obtained in a free marketplace. (CITZ00267)

The costs of implementing these standards would cause many older coal-fired plants to be shut down, and create incentives for switching to cleaner forms of energy. If national standards are not imposed, the coal industry will continue to receive a subsidy in the form of cheap disposal costs that will keep coal cheaper than alternative forms of energy. (SIERRA00278)

EPA should use this issue of CCW to bring to the attention of Congress the need for alternative energy forms. (SOCM00279)

National regulations on the disposal of CCW such as requirements for liners, groundwater monitoring, and leachate collection systems would be a serious blow to the reign of King Coal. The EPA report says the costs of implementing these standards under the federal hazardous waste laws would cause many older coal-fired plants to be shut down and create an incentive for newer plants to switch to cleaner forms of energy. If national standards are not imposed, the coal industry will continue to be subsidized -- cheap waste disposal costs will keep coal cheaper than alternative forms of energy. (CITZ00284)

## **XXII. ENVIRONMENTAL JUSTICE**

A public interest group commenter argued that the environmental and public health hazards of FFC waste management are inequitably borne by economically disadvantaged and racial and ethnic minority populations. The commenter based this argument on demographic analysis of 22 selected facilities. In the commenter's analysis, more than half of the selected facilities are surrounded by communities with average incomes at or below \$15,000 per year and almost half by communities with minority populations greater than the national average. The commenter requested that EPA undertake additional analysis of environmental justice impacts. Another public interest group commenter argued that impacts from minefilling will be disproportionately borne by low-income communities and that the Agency was therefore violating the Executive Order on environmental justice.

An industry trade group commenter, on the other hand, stated that it had surveyed its members and identified no environmental justice claims related to FFC waste management. The commenter further stated that its members are not aware of subsistence farming occurring in the proximity of FFC waste management units. Similarly, it is highly unlikely that subsistence farmers (or their children) would come in contact with FFC wastes used as agricultural soil amendments because current applications primarily involve field scale research and the projected future market is comprised of large farming enterprises. The commenter additionally argued that consideration of environmental justice issues would be more appropriate in facility-specific permitting than in a rulemaking with national scope because, while some sites are located within one to five miles of predominantly minority or low income areas, the vast majority are in areas with predominantly non-low income and Caucasian populations. The commenter believed that EPA had adequately responded to the Executive Order on environmental justice and noted that this Order does not alter the permissible scope of the Bevill study and cannot override congressional intent.

Response: EPA appreciates the commenters time and efforts for submitting the additional information on environmental justice issues. EPA has reviewed this information and conducted an additional analysis of the available demographic data for populations surrounding fossil fuel combustion facilities. This additional analysis is based on 1990 Census data for minority populations around coal-fired utilities, coal-fired non-utilities, and oil-fired utilities. Data were not readily available for FBC facilities or minefill sites, nor were income statistics.

This additional EPA analysis compared minority populations within one mile of fossil fuel combustion facilities to the national average of approximately 16 percent. As shown in Table 5 below, overall minority populations (29 percent) near FFC facilities is greater (statistically significant) than the national average. As shown in Table 6, however, this observation holds at a relatively small number of facilities (188 of the 1409 facilities identified, or 13 percent) with large (statistically significant) minority populations. Many facilities (36 percent of facilities) have no population at all within one mile. Based on this analysis, EPA concludes that, on a national basis, minority populations are not disproportionately located near fossil fuel burners, i.e., 13 %

of facilities have minority populations greater than the national average but 31 % of facilities have minority populations less than the national average. Thus, while some facilities do have minority populations that are greater than the national average, site-specific issues affecting nearby populations at those facilities should be considered on a case-by-case basis. The Agency, therefore, concludes that consideration of environmental justice issues at coal burning facilities is more appropriate on a case-by-case basis than in a national rulemaking. The Agency believes that the information presented by commenters on the 22 facilities also supports this conclusion. That is, for the 22 facilities presented by commenters, the majority of the facilities have minority populations equal to or less than the national average. For minefilling, the Agency will evaluate environmental justice considerations in further detail when it undertakes the development of national regulations for this practice.

**Table 5. Minority Populations within One Mile of Fossil Fuel Combustion (FFC) Facilities**

<b>Sector</b>	<b>Number of Facilities</b>	<b>Population within one mile</b>	<b>Percent Minority</b>
Coal-fired Utilities	471	836,097	21.5%
Coal-fired Non-utilities	842	4,468,898	28.7% *
Oil-fired Utilities	96	1,207,593	35.6% *
Total FFC Facilities	1,409	6,512,588	29.0% *
Total U.S. Population	--	248,765,000	16.1%

\* Percent minority significantly greater than U.S. average at the 5 percent significance level.  
Population data based on 1990 U.S. Census estimates.

**Table 6. Minority Populations by Facility**

Sector	Number of Facilities	Percent of Facilities			
		No Population within one mile	Minority Population Significantly Less than Average	Minority Population Not Significantly Different than Average	Minority Population Significantly Greater than Average
Coal-fired Utilities	471	58%	24%	11%	6%
Coal-fired Non-utilities	842	24%	36%	24%	16%
Oil-fired Utilities	96	36%	21%	16%	27%
Total FFC Facilities	1,409	36%	31%	19%	13%



## **XXII. ENVIRONMENTAL JUSTICE**

### **Verbatim Commenter Statements**

The environmental and public health hazards associated with on-site FFC waste management and disposal facilities at electric generating stations are inequitably borne by economically disadvantaged and racial and ethnic minority populations. (ALA00292)

The information presented here illustrates that there are environmental justice concerns for people residing close to FFC waste facilities ... In Appendix A, maps showing the location of 22 power plants are provided. These plants were selected based on an initial screening of a national power plant database and sorting the plants by population within 1 mile and median income. The maps illustrate the bodies of water within 1 mile of the plant and provide some summary demographic information about median income and age of residents within 1 mile ... In Table 9 below, we also present median income and race statistics. More than half have average incomes at or below \$15,000 per year. Almost half of the facilities are surrounded by communities with minority populations greater than the national average. This demonstrates that the environmental hazards from FFC waste facilities, which are felt most keenly by those living closest to the plants, are inequitably distributed by race and income. (ALA00292)

In order to reduce risks for all communities the Agency must examine how environmental problems converge in these locations and how the people who live in these places are cumulatively affected by them. The draft regulatory determination must be revised accordingly to address these issues. An analysis of populations living near FFC waste facilities, and reliant on private drinking water wells, also should be undertaken and the results evaluated - not only to identify additional environmental issues generally, but also specifically to identify additional impacts to persons of color or economically disadvantaged persons in these areas. (ALA00292)

The Citizens Coal Council has carefully examined data from the U.S. Census Bureau (1992 City-County Yearbook) and found that coal mines are located in communities that suffer from poverty and unemployment rates higher than the national average and per capita income below the national average. The 1990 census data shows that for 118 of the 120 coal-producing counties, the trend is the more coal produced, the higher the poverty rate. The sole exception is two coal-producing counties in Wyoming. Unless the federal government enacts strict regulations on the dumping of CCW, utilities will dump CCW into strip mine pits located in Pike, Perry, Harlan and Leslie Counties, Kentucky; Mingo, Boone, and Logan Counties, West Virginia; Greene and Indiana County, Pennsylvania; San Juan and McKinley Counties, New Mexico; Perry, Saline and Franklin Counties, Illinois; Navajo County, Arizona; and Warrick, Sullivan, Daviess, and Pike Counties, Indiana. Census data shows all these counties share common problems - their populations are poorer, less educated and less employed than those without coal mining. Their homes are damaged by the blasts at coal mines. They breathe the dust from coal mines and live near power plants that belch toxic air pollution. Their water supplies are polluted or too often completely destroyed. Their homes are destroyed when companies mine coal beneath their property and the land caves

in. If the EPA allows utilities to dump CCW into strip pits, the future water pollution problems will be disproportionately borne by these low-income communities. In its "Report to Congress and Draft Federal Regulatory Determination on Fossil Fuel Wastes," the Environmental Protection Agency has shown gross insensitivity to its avowed advocacy role for environmental justice. EPA's report is so seriously deficient that it violates President Clinton's environmental justice executive order by failing to recommend strict federal regulation of CCW disposal -- disposal that will disproportionately impact low-income coalfield communities. (HEC00056)

The management of FFC wastes and products does not Adversely impact low income or minority communities. Based upon a review of EPA's demographic database and member company inquiries, USWAG believes that EPA has adequately responded to Executive Order 12898 (Feb. 11, 1994) and considered whether its regulatory determination may have disproportionate impacts. It is important to remember that the specialized interests addressed by Executive Order 12898 do not alter the permissible scope of the Beville study or regulatory determination. (USWAG00275)

In response to EPA's request in the Report to Congress for comment on environmental justice implications (2 RTC at 2-5) USWAG requested its members to identify any environmental justice issues associated with their FFC waste management facilities. None was identified. EPA's demographic database, based on the 1990 U.S. census data, indicates no disproportionate impacts from FFC waste management. Indeed, it should come as no surprise that EPA found that electric utility generation sites are located throughout the country in various settings, including highly industrialized urban areas and sparsely settled rural areas. While some sites are located within one to five miles of predominantly minority or low income areas, the vast majority are in predominantly non-low income and Caucasian. (USWAG00275)

EPA's regulatory determination on FFC wastes will affect the spectrum of locations throughout the country. To the extent, if any, that environmental justice considerations have any bearing on FFC waste regulatory policy, EPA must keep in mind that this is not a facility permit renewal proceeding where impacts on discrete populations in proximity to individual facilities should be analyzed. Rather, this is a national policy making proceeding that requires a macroscopic focus. We stress that even at the community level, we know of no environmental justice claims related to FFC waste management. (USWAG00275)

EPA specifically posed the question whether low-income or minority subsistence farmers may be at heightened risk. 2 RTC at 2-5. USWAG members are not aware of "subsistence farming" occurring in the proximity of its FFC waste management units. Similarly, it is highly unlikely that subsistence farmers (or their children) would ever come in contact with coal combustion products beneficially used as agricultural soil amendments. Current soil amendment applications primarily involve field scale research conducted by research institutions and industry, and the projected future market for this use is comprised of large farming enterprises. (USWAG00275)

### **XXIII. INCORPORATION BY REFERENCE**

A number of commenters incorporated by reference, cited, or specifically agreed with the comments submitted by other commenters. To aid in understanding the commenter population, the specific instances are listed below:

- Two commenters supported the comments of the Ohio Department of Development.
- Four commenters supported the comments of the National Mining Association.
- One commenter supported the comments of Bradley Paul of the University of Southern Illinois and Konrad Banaczak.
- One commenter supported the comments of Barry Sheetz of Penn State University.
- One commenter supported the comments of the Anthracite Region Independent Power Producers Association.
- Two commenters supported the comments of the American Coal Ash Association.
- Three commenters supported the comments of the Pennsylvania Department of Environmental Protection.
- Six commenters supported the comments of the U.S. Department of Agriculture.
- Four commenters supported the comments of the Utility Solid Waste Activities Group.
- One commenter supported the comments of members of the Pennsylvania State Legislature, the Pennsylvania Environmental Council, and Stream Restoration Incorporated.
- One commenter supported the comments of the Environmental Defense Fund.
- One commenter supported the comments of the Hoosier Environmental Council.
- One commenter supported the comments of the National Citizens Coal Law Project.

### **XXIII. INCORPORATION BY REFERENCE**

#### **Verbatim Commenter Statements**

The DMR supports the comments and positions of OCDO regarding this report contained in their letter of June 1, 1999 which is enclosed. (OHDNR00028)

We are a member of the American Coal Ash Association (ACAA). They and our co-sponsors in research have submitted comments on the EPA report referenced above. We agree and would like to endorse these comments by ACAA and The Ohio Coal Development Office that specifically address their concern for not interfering with or complicating beneficial uses in agriculture and minefill applications. (DTC00038)

PCA endorses the comments and testimony submitted by and on behalf of the National Mining Association and its members; ARIPPA, which is an associate member of PCA; and the American Coal Ash Association. PCA also refers EPA to the voluminous technical information and comments submitted by the Pennsylvania Department of Environmental Protection (DEP), which show the Commonwealth's history of responsible management of these substances, and the resulting benefits of such use. (PCA00034)

PCA shares the US Department of Agriculture's concerns about the risk assessment methodologies and assumptions used by EPA in evaluating risks. We join USDA in recommending that these concerns be resolved prior to submitting a final report to Congress. (PCA00034)

Mettiki Coal Corporation (MCC) ... is also a member of the National Mining Association (NMA) and fully supports the comments filed by the NMA. (MCC00051)

DEP provides the following summary of issues and incorporates by reference the detailed comments of the National Mining Association ("NMA"). (WVDEPL0003)

In its March 1999 comments the National Mining Association (NMA) well-supported its conclusion that the agency's concerns are unfounded with site-specific examples of ash disposal sites in Illinois and Indiana where disposal below the water table had created no problems ... ICC concurs with Dr. Banaszak's and Dr. Paul's conclusions. (ICC00269)

To cite but one flaw, one cannot determine whether the EPA CMTP risk assessment code utilized by EPA included the utilization of the 13 steps recommended by the peer review committee. This flaw is fully explained in materials prepared by Professor Barry E. Sheetz (Pennsylvania State University), which have been submitted to EPA. (CIBO00280)

PaDEP's comments to EPA noted that data from the nearly 100 mine sites throughout Pennsylvania where ash has been used as a supplement for soils or minefill demonstrate that "the use of ash does

not result in groundwater degradation when used in accordance with the regulations and guidance in effect in Pennsylvania.” The three volumes of supporting data submitted by PaDEP provide ample data to support PaDEP’s conclusions. (ARIPPA00273)

I have enclosed for your review a copy of correspondence dated 9 September 1999 addressed to you by Pennsylvania Department of Environmental Protection secretary James M. Seif, requesting that you determine coal-ash and waste-coal ash in mine reclamation and agricultural projects as non-hazardous waste. (PAL0004)

I strongly support the comments made on the risk assessment by my colleague, Dr. Rufus Chaney, USDA-ARS, with whom I worked on the 503 risk assessment. Dr. Chaney is one of the preeminent trace element biogeochemists in the world and his critique of the risk assessment should be strongly heeded. (NVIC00039)

These results coupled with Dr. Chaney’s comments on the flawed risk assessments used in the report, indicate very low As risk from agricultural or mine reclamation uses of FFCWs. To Dr. Chaney’s comments, I would add that risk assessment of mine reclamation use of FFCW should recognize that plant material grown on these sites is not used as feed or fodder and so does not enter the food chain. It is only several years after reclamation that some mined areas are returned to production agriculture use. (PSU00040)

Virginia Power defers all technical comments to the submittal provided by the Department of Agriculture during the May 21 public hearing, and other related documents submitted by the Department of Agriculture on the use of coal combustion by-products in beneficial agricultural applications. (VAP00042)

Another reviewer, specifically Dr. Rufus L. Chaney (USDA), has largely addressed ISG’s concerns about methods for risk assessment. ISG agrees with Dr. Chaney that significant amounts of research have already been performed on the interaction of fluidized bed ashes with forage crops, livestock, and food chain effects. ISG also wants to bring to EPA’s attention the USDA research articles that have already been cited to EPA in the CIBO 1997 document submitted to the agency. (ISG00048)

I received a copy of comments on the above-referenced document which were authored by Dr. Rufus Chaney, with the USDA’s Agricultural Research Service. Dr. Chaney also worked on the risk assessment that was conducted to develop the USEPA’s regulations controlling the beneficial use and disposal of biosolids (40 CFR Part 503). After reading Dr. Chaney’s comments, Bio Gro was compelled to comment on this report. Bio Gro wishes to reiterate all of the scientific comments that were made by Dr. Chaney to you in his letter to dated on May 21, 1999. We respectfully submit a copy of his letter to you as our comments on this particular report. (BG00063)

APS is also a member of the Utility Solid Wastes Activities Group (USWAG). APS fully supports and endorses the separate detailed comments of USWAG in response to EPA's RTC. (APSC00043)

We are fully supportive of the comments submitted by the Utility Solid Waste Activities Group (USWAG) and would like to offer the following additional comments. (TVA00049)

TXU also supports comments on the RTC submitted on behalf of the Utility Solid Waste Activities Group ("USWAG") under separate cover.(TXU00053)

AEP's views and detailed comments on the Phase II Report are expressed in comments filed by USWAG. (AEP00060)

The reclamation work that the waste coal plants are performing has broad public support in Pennsylvania, as evidenced by letters that have been submitted to EPA by, among others, the Pennsylvania Environmental Council, the Pennsylvania Department of Environmental Protection, the Joint Legislative Air & Water Pollution Control and Conservation Committee, the Majority and Minority Chairman of the Senate Environmental Resources Committee, the Chairman of the House Environmental Resources Committee, and other individual legislators. Copies of these letters are attached hereto as Appendix IV. (ARIPPA00273)

Other commenters have ably discussed this Issue on the record in this case. See Comment letter of the Environmental Defense Fund (June 14, 1999), Docket F-1999-FF2P-FFFFF. We agree with these commenters that EPA's practice in this docket to date is, at best highly irregular, and likely illegal, given Agency precedent (ALA00292)

We want to emphasize in the strongest possible terms, our support of the Hoosier Environmental Council's efforts in this regard --we have seen the file after file, the manifold documents and studies which show that coal wastes dumped over watersheds leaches dangerous materials. We feel that it is not only dangerous to the many on well and spring water, but to those coming onto municipal water systems as well--most of those systems rely also on well and spring water--or draw from the rivers fed by such aquifers. (PEACE00306)

Here we defer to comments being submitted on our behalf under separate cover by Tom FitzGerald, Director of the Kentucky Resources Council. (HEC00332)

